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PROCEEDINGS and REPORTS

of the

Belfast Natural History
and Philosophical Society

SECOND SERIES.

VOLUME 1.

BRITISH MUSEUM

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BRITISH MUSEUM NATURAL HISTORY

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1821

PROCEEDINGS and REPORTS . .

of the

Belfast Natural History
and Philosophical Society

SECOND SERIES: VOL. I, PART I

SESSION 1935-1936

PRICE - - - TWO SHILLINGS

PROCEEDINGS and REPORTS

of the

Belfast Natural History and Philosophical Society

Second Series: Vol. I, Part I.
SESSION 1935-1936.

EDITED BY ARTHUR DEANE, F.R.S.E., M.R.I.A.,
HON. SECRETARY.

BELFAST:
THE NORTHERN WHIG, LTD., PRINTERS, BRIDGE STREET
1937.

BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

[Established 1821.]

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The membership of the Society consists of Shareholders, Annual Subscribers and Honorary Members.

Shareholders holding more than two shares are not liable for an annual subscription, but shareholders of two shares pay an annual subscription of five shillings, and holders of one pay ten shillings.

In 1914 a new class of membership was created including persons of either sex, to be elected under the bye-laws of the Society, and admitted by the Council on payment of ten shillings per annum. Such members have all the privileges of the Society, and take part in any business of the Society not affecting the ownership of the property. In 1917 an Archaeological Section was founded. Persons wishing to join the Section must be members of the Society and pay an additional minimum subscription of five shillings per annum.

A general meeting of Shareholders and Members is held annually to receive the Report of the Council and the Statement of Accounts for the preceding year ending 31st October, to elect members of Council, to replace those retiring by rotation or for other reasons and to transact any other business incidental to an Annual Meeting.

The Council elect from among their own number the President and other officers of the Society.

Each member has the right of personal attendance at the ordinary lectures of the Society, and the privilege of introducing two friends for admission to such.

Any further information required may be obtained from the Hon. Secretary, at 7 College Square North, Belfast.

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Founded 5th June, 1821.

Application Form for Membership.

To be filled up by the Candidate

Name, etc. ....
[Please write name in full.]

Description ....

Residence ....

....

...., being desirous of becoming a Member of the Society, I, the undersigned member, recommend...............as a suitable candidate for election.

Dated this.................day of.. .....19.....

Signature of Member ....

[Candidate must be known to the Member signing this form.]
[*All applications are subject to the approval of the Council.*]

Received...

Elected by Council ....

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Signature of Candidate } ....

[*All applications for Membership to the Section are subject to the approval of the Archaeological Committee.*]

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Hon. Secretary,
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Old Museum Buildings,
7 College Square N.

12th November, 1935.

Dr. R. H. Hunter, President, in the Chair.

PROFESSOR R. A. S. MACALISTER, Litt.D., M.R.I.A.

THE STORY OF CLONMACNOIS.

Clonmacnois, the most important ancient ecclesiastical establishment in Ireland, is situated on the left bank of the Shannon about twelve miles downstream from Athlone. It is in the middle of a rather dreary bogland region, and it was doubtless this fact which had some influence in determining the choice of its site. The foundation by "Ciarán the son of the Wright" is dated 548 A.D.: but it makes a momentary entry into history about a century earlier. The story is to the effect that Patrick sent certain of his followers on a pilgrimage to Rome. They returned, bringing precious relics to their master. On their way to *Cruachan Aigle* (Croagh Patrick), where the apostle was then sojourning, night fell on them when they reached the future site of Clonmacnois, and for safety's sake they deposited the relics inside a hollow elm-tree which grew on the spot. In the morning they found to their dismay that the tree had closed round the relics, and not even with an axe could they recover them. In great distress they pursued their journey, and told the sad news when they arrived at their destination. But Patrick bade them be of good cheer; for the relics were thus guarded for him who should come to the place in days yet in the future.

This tale is similar to others that are narrated about the places where early monasteries were founded: there was often there some magical tree, animal, or other uncanny feature. It strongly suggests that the site already possessed a measure of sanctity in pre-Christian days: that the consecration which it received at the erection of the monastery was really a re-consecration, a transference of its sanctity from an older to a later form of faith.

It was early in 548 that Ciarán reached the site. He was the son of a carriage-builder living in what is now Co. Roscommon, by name Beoit, and he had early been devoted to learning and to the service of the church. He had studied with Enda on Aran and with Findian at Clonard; and now, with twelve followers, he arrived to establish his monastery. A fortunate accident secured royal patronage for the new foundation. As he was struggling to raise the heavy corner-post of his wooden church, a passing warrior, at his request, good-naturedly assisted him; in return for which Ciarán promised to him the kingship of Ireland. However it may have come about, the promise was fulfilled, and Diarmait mac Cerbhaill, for it was he, ever afterward showed special favour to Clonmacnois—a favour continued by his successors.

The scene seems to be depicted on the great stone cross which commemorates a later royal patron, Flann Sinna, King of Ireland, who died in 913. One of the panels on the stem of this monument depicts two persons, an ecclesiastic and an armed warrior, holding between them a beam in an upright position, and apparently thrusting it into the ground.

The orthodox story, told in all the lives of Ciarán, is to the effect that he lived only seven months after he had established himself at Clonmacnois, dying there in the September of the same year. There are some calendar difficulties, however: the biographer mentions the day of the week and the age of the moon on the day of his death, and neither of these will accord with the day of the month. There is a fair, but not an exact, accordance on a day seven years later, and probably that is the true date. The biographers were fond of drawing parallels between the life of Ciarán and that of Christ, and they could not resist the temptation of knocking a number of years off Ciarán's life so as to reduce his age to 33, the traditional age of Christ at the Crucifixion.

The monastery soon began to increase in fame and in riches. Even during Ciarán's lifetime, we are told, Frankish wine-merchants sailed up the Shannon—in the very middle of Ireland—and there disposed of their wares. Unlike several other monasteries (such as Monasterboice), the history of which is very imperfectly recorded, we have what appears to be a very complete roll of the Abbots, and names of a large number of other personages, who served the monastery in various capacities. Some of its men of learning acquired fame beyond the Irish sea: such were Colcu na Duinechda (d. 795 A.D.), the friend and confident of Alcuin, and Suibne mac Maile-Humai (d. 890), whose death, as *Doctor peritissimus Scottorum*, is recorded, not only in the native annals, but also in the Chronicle of Florence of Worcester. In its library were *The Book of the Dun Cow* (*Lebor na Huidri*), now one of the chief treasures of the Royal Irish Academy, and the hardly less important manuscript now class-marked Rawlinson, B. 502, in the Bodleian library: and the large collection of sculptured burial slabs, still to be seen, testify to a skill in art-designing which must have been developed on the site by special studies. In the years following Ciarán's death the monastery must have increased rapidly, and doubtless a small town, if we can dignify it by such a name, grew up at its doors, to minister to its needs.

The history of the monastery was not all a path of roses. It had many troubles throughout the thousand years which it lasted. It was burnt three times in the eighth century, six times in the ninth century, twice in the tenth century, four times in the eleventh century, three times in the twelfth century, and twice in the thirteenth century. Some of these burnings were no doubt of the secular village around the monastery; but they must have affected the monastery to some extent. Moreover, it was plundered twice in the ninth century, seven times in the tenth century, eleven times in the eleventh century, five times in the twelfth century, twice in the thirteenth, and finally in 1552, when the whole place was reduced to its present desolation. These plunderings were not all the work of Scandinavians or other foreigners; at least half of them were by native raiders. It is indeed surprising that it was able to weather so many storms. We must suppose that the destroyed buildings were all of wood, and therefore easily replaced; and many of the plunderings were not so much of gold and silver, but of cattle. In 842 the principal church was turned by the Viking Chieftain, Turgeis, during the years when he lorded it over central Ireland, into a heathen temple: his wife, Authr, who was a sorceress, sat on the high altar and gave oracles. These untoward events, interspersed with pestilences, floods, storms, and supposed supernatural potents, fill up the historical record. In estimating the value of this record, and its relation to the true life of the institution, it should be remembered that historians, as a rule, record the exceptional events: they do not trouble to tell us of the course of normal life. This we must assume as moving on in the background all the time, only slightly interrupted by the casualties.

The remains still to be seen on the site (which were described with the aid of lantern slides) form the most extensive series of monastic structures to be seen in Ireland. As usual, only the churches survive; the wooden domestic buildings have all perished. In addition, there is a castle, with an extensive series of earthworks associated, outside the monastic enclosure. The history of this building is unknown, except for the fact that it was erected by the English in 1220 A.D., and for the names of a few of its custodians. The ruins show clearly that it came to its end by an explosion of gunpowder, perhaps in 1552, when the monastery was destroyed, but this is a mere conjecture.

Nine church buildings remain, and the names of four others are recorded, which cannot be identified with any of the existing structures. These are:—

(1) St. Ciaran's church, a small structure 12 ft. 6 ins. by 8 ft. internally; much rebuilt. Probably on the site of the original wooden structure. Two fragments of monumental stones are built into the church wall. The fine "Crozier of Clonmacnois" was found inside this structure.

(2) Dowling's church, so called from its seventeenth century restorer, but in reality one of the oldest buildings on the site. A rectangular building 31 ft. 6 ins. by 16 ft. with corner *antae*. The west doorway is a late insertion.

(3) The Cathedral, another oblong building, 62 ft. by 28 ft. 8 ins., with a good but much mutilated Romanesque west doorway. The north doorway, which bears an inscription dating it to about 1460 A.D., with the vaulted chancel, now destroyed, though there are sufficient remains to restore it, are interesting late Gothic insertions. On the south side there is a sacristy, with a priest's chamber above.

(4) O'Connor's church, built by Cathal na Conchobhair, King of Connacht, who died about 1010. A simple Romanesque structure of no great interest. It has been restored for use in Protestant worship.

(5) "Melaghlin's Church," also called the "King's Church." An early twelfth century building, oblong, 41 ft. by 17 ft. 8 ins. The door is in the south side. The chief architectural feature is the east window, of two round-headed lights, which is a simple but very pleasing composition.

(6) Kelly's church, probably erected 1167, but now reduced to a mere foundation, north of the Cathedral.

(7) MacCarthy's or St. Finghin's church. One of the two churches with a division into nave and chancel (the chancel in the Cathedral being a late insertion). The nave is oblong, 29 ft. by 14 ft. 5 ins., and had an ornamental south door, now ruined to the foundations. A simple but effective chancel arch leads into the very small chancel, which is almost an exact square (8 ft. 8 ins. by 8 ft. 6 ins.), with a round-headed window, and a doorway on the south side leading into the tower which is, as usual, round, but exceptionally intrinsic part of the building.

(8) The Nunnery church, in a separate graveyard a short distance from the main enclosure. It is also in two parts, nave and chancel; the west doorway and the chancel arch are admirable examples of Romanesque.

(9) Hurpan's church. A seventeenth century building attached to the east end of Dowling's church.

Besides these churches, there is a detached Round Tower, which has lost its cap; the present height is 62 ft. It was struck by lightning in 1135, when the top was destroyed: it was afterwards rebuilt, and the restored masonry can be clearly identified. There are also three sculptured crosses: King Flann's cross, erected about 913 A.D. in memory of the King of Ireland of that name, who died in that year, covered with figure-sculpture: the south cross, an elaborately decorated monument, but with only one figured panel (a Crucifixion): and the north cross, a once equally elaborate monument, now, however, reduced to a much-decayed stump.

Over two hundred memorial slabs are extant or recorded from the site. These have all been collected together in a volume published by the Royal Society of Antiquaries of Ireland, and fully illustrated (except for a few which have come to light since the publication). In the same volume will be found other illustrations of the monuments, and a chronological table of the history of the monastery.

26th November, 1935.

The President, Dr. R. H. Hunter, M.R.I.A.

"THE GLANDS OF DESTINY."

[No Abstract.]

10th December, 1935.

Professor J. K. Charlesworth, D.Sc., Ph.D., M.R.I.A.

"CLIMATE THROUGH THE AGES."

[No Abstract.]

14th January, 1936.

Professor T. Thomson Flynn, D.Sc., M.R.I.A.

"WHALES AND THEIR ORIGIN."

[No Abstract.]

28th January, 1936.

Dr. R. H. Hunter, President, in the Chair.

PROFESSOR K. G. EMELEUS, M.A., Ph.D., M.R.I.A.

THE DEVELOPMENT OF PHYSICS IN THE TWENTIETH CENTURY.

The fascination of physics comes in no small degree from its wide range and ramifications. It is concerned with all phenomena of inanimate matter, employs and has been the source of much mathematics, and shades off without any sharp boundary into engineering science. Recently Bohr has raised the question of whether its formalism may not be also the proper approach to description of life. Much modern physics is also simultaneously spectacular and easily understood, and has become familiar to many people through the books of C. G. Darwin, Eddington and Jeans. The business of the physicist is to trace continuous threads through the maze of facts, and to be always looking for new correlations as well as extending boundaries. The way in which this may be done is well illustrated by recent phases of the history of investigations on the speed of light, and on the nature of matter.

It is a commonplace that for most ordinary purposes the passage of light from one place to another can be considered to take place instantaneously. Its actual speed, approximately 186,000 miles per second in air (or what is almost equivalent, in a vacuum) is so great that Galileo failed to measure it by the crude direct method that serves to find the much smaller speed of sound in air, 1,100 feet per second. It was first found by two astronomical methods, in one of which the passage of light over a large astronomical distance was timed, whilst in the other the speed was compared directly with a large speed, that of the earth in its orbit. The first successful attempt to find *c*, the symbol now usually used for this speed, in the laboratory, was described by the French physicist, Fizeau, in 1849. Light was sent out from a source in a beam which was returned along its original path by reflection from a distant mirror, and the time it took on the combined outward and inward journey measured by rotating into the returning beam a shutter which just intercepted it. Another laboratory method was developed by Foucault, in which the timing was effectively done by a mirror in rapid rotation, from the surface of which the beam of light was reflected. The results obtained by these methods were in substantial agreement with those obtained astronomically.

Shortly after this, Maxwell (1867) made the great step of identifying light with the waves of electric and magnetic disturbances which radiate from accelerated electric charges or magnetic poles. In his theory *c* appears as the connecting link between electricity and magnetism, and it is shown that it may be found by ordinary electrical and magnetic experiments, not obviously connected with light at all. Confirmation of this was given by Maxwell himself, and a little later by Hertz, in a series of experiments which form the basis of modern

" wireless," radio waves being light waves of macroscopic wave-length. Excepting only perhaps the doctrine of energy, due chiefly to Joule, Kelvin and Willard Gibbs, Maxwell's theory of light, correlating optics, electricity and magnetism, is probably to be regarded as the greatest generalisation in physics in the 19th century. For the phenomena it was intended to cover it still stands, an early development by Lorentz and a recent tentative extension by Born taking it as the starting point.

The speed of light is now one of the most accurately determined of the fundamental physical constants. A. Michelson, who devoted much of his life to its determination by the rotating mirror method, completed a series of experiments in 1926, involving almost 2,000 observations, which yielded for it the value 299,796 kilometres per second, with an uncertainty of only 2 or 3 in the last figure. This remarkable precision was made possible through the co-operation of U.S. government survey officers, who measured with special care the length of the light path between the moving and stationery mirrors. Their interest in the work was stimulated partly by the hope that similar optical apparatus might be of use for accurate measurement of long distances once *c* had been found with sufficient accuracy, much as earlier work by Michelson and Fabry had lead to a reproducible standard of length by precise determination of how many waves of a certain red light went to the prototype metre.

Michelson made another series of experiments on the speed of light, at the end of last century, which have shown that the quantity *c* has another role in physics, quite different from its function in Maxwell's theory. These arose from experiments made on light propagation by Airy and Fizeau earlier in the century, which had been difficult to interpret. An account of this work is given in Michelson's book on " Light Waves and Their Uses " (1903). His aim was to study the motion of the earth in space by the effect of this motion on the propagation of light in apparatus on its surface. For this purpose he made an instrument which he called an interferometer, which should have registered indirectly some minute alterations in the apparent speed of light through it as its direction was changed. The type of result to be expected was predicted by Maxwell. Actually the apparatus failed completely to shew the effect. Michelson's own comment was that " the problem, by leading to the invention of the interferometer (which has many other uses, such as lens-testing) more than compensated for the fact that this particular experiment gave a negative result."

The negative result required explanation, nevertheless. Fitzgerald showed that it would be obtained if the interferometer were to change its size reversibly as it was turned, to an extent just sufficient to counteract the effect of the earth's motion. This apparently fantastic suggestion can be justified by an extension of the theory of moving electric charges, if matter is supposed to be of an electrical nature, and is part of the complete solution. The latter was given by Einstein in what is known now as the special theory of relativity. This cannot be dealt with in detail here, and only three points in it, directly concerned with *c*, can be mentioned. The first is the method of using Michelson's null result: no attempt is made to explain it away, but it is *accepted* and treated as fundamental. Stated in the simplest terms, the experiment shews that the measured speed of light within the apparatus is the same whatever the orientation of the apparatus and the path taken by the light. This in incompatible with the ordinary concepts of what is involved in measurements of space and time, and hence there follows the basic revision of these ideas in the relativity theory, with the Fitzgerald contraction as a corrolary. The second point is that the development of the theory indicates that c, initially introduced as a constant, should also be the maximum speed with which matter or energy can be moved from place to place. If an attempt were made to move any body more swiftly, it would automatically counteract this by increasing its inertia. The third is that matter appears to be not indestructible, but capable of conversion into energy, every gram of matter disappearing producing c^2 units of energy, and *vice versa*. Both predictions have now been verified quantitatively, principally in connection with study of nuclei of atoms, and emphasize the fundamental and unexpected part which c plays.

Acceptance of apparently absurd experimental results also lies at the root of the modern theory of matter and radiation known as the quantum mechanics. The physical basis of this was first stated clearly by Bohr in 1927, and elaborated a little later by Heisenberg, although the main part of its mathematical machinery had been formulated a little earlier, and an essential part of it had been discovered as early as 1900. The paradox is that matter appears to be built up of atomic units which are both particles and waves.

The lightest common constituent of matter, the electron or atom of negative electricity, has this dual nature. Electrons can be counted individually by delicate apparatus, and have when moving slowly a definite mass, 9.10^{-28} gm., which increases with speed in the way required by the theory of relativity. If one moving sufficiently swiftly is fired into a vessel supersaturated with water vapour, it goes through the gas for some distance before it loses its energy, and a thin line of dew forms where it has passed. This can be seen and photographed, and would appear to give unambiguous proof that the electron which has produced it is a particle.

On the other hand, strong evidence can be obtained that electrons are waves. When a narrow homogeneous beam of electrons is fired through a thin film of metal or a thin leaf of mica, it emerges as a set of discrete beams, inclined to one another in a regular pattern. This is similar to what occurs when light passes through a fine fabric such as the covering of an umbrella. Viewed through this, a distant lamp is seen to be surrounded by a regularly arranged series of images, falling off in intensity on passing away from the main central one. Just as this is a consequence of the passage of light waves through the regular mesh of the fabric, so the fact that a regular sheaf of electron beams is obtained can be regarded as due to electron waves passing through the three-dimensional grating-like arrangement of atoms in the metal or mica. Similar results can be obtained with other atomic units usually regarded as particles, as well as with light and heat radiation, and X-rays, more usually regarded as waves. All appear to have a dual nature, and to be both particle and wave.

The origin of the difficulty is that we are trying unjustifiably to apply to atomic phenomena the concepts and laws which apply to larger scale events. It has been seen that the ordinary mechanical laws fail when speeds comparable with that of light are involved. The same occurs in dealing with atomic and subatomic events. In both instances the main cause for surprise might well be that ordinary language serves as well as it does.

The fact is that the electron (for example) is neither particle nor wave, but a type of thing with which we do not have to deal ordinarily. Its properties merely approximate to those of particles under one set of conditions, and to those of waves under another set of conditions. The aggregate of its properties can, like the result of Michelson's experiment, be formulated mathematically, and the resulting equations have been developed, with continual control of their implications by reference to experiment, until, it has been asserted, all the properties of electrons in atoms can be regarded as formally understood. This is perhaps too optimistic a statement, but it is at least certain that the majority of these properties have been shown to be connected by a theory which involves exceedingly few independent hypotheses, and that the same hypotheses go a long way towards forming a basis for the theory of the structure of the nuclei of atoms, which is not yet so far advanced as that of the extranuclear structure.

It would be futile to predict how physics will develop, even in the next decade. It is certain that much attention will be paid to nuclear phenomena (natural and artificial radioactivity, cosmic radiation and atomic weights), and likely that progress will be made towards finding the physical distinction between living and inanimate matter. But there are many odds and ends known now which have not yet been fitted into existing schemes, and it is possible that some of these, or hitherto unrecognized phenomena, may make it necessary to recast more or less radically some views held at present. The correct attitude to take is probably still that which Swift adopted towards attractions.

APPENDIX.

An obituary notice of Michelson, by H. G. Gale, was published in vol. LXXIV of *The Astrophysical Journal* (1931) ; this contains a sketch of his work. Full accounts of the topics touched on in this lecture will be found in Einstein's " Theory of Relativity," C. G. Darwin's " New Conceptions of Matter," Born's " Atomic Physics," and Bohr's " Atomtheorie und Naturbeschreibung." Darwin's book is particularly lucid, and not mathematical. The type of experimental work involved in study of the border between physics and biology is indicated by the contents of a letter in *Nature*, for December 19, 1936, from F. C. Bawden, N. W. Pirie, J. D. Bernal, and I. Fankuchen.

11th February, 1936.

Dr. R. H. Hunter, M.R.I.A., President, in the Chair.

T. W Moody, B.A., Ph.D.

REDMOND O'HANLON

It is a curious fact that the name, long borne by one of the two great parties which fill so large a space in the history of parliamentary government in England, first became current in Ireland, about the middle of the seventeenth century, to designate a class of professional bandits and terrorists. "Tory" is an anglicised version of an Irish word meaning "pursuer," "attacker," or "raider." In the minds of his contemporaries, Redmond O'Hanlon was a prince among tories. In his heyday he was a constant thorn in the side of the Irish government. After his death he became the subject of a romantic legend in which he figures as an Irish Robin Hood. I shall attempt to give you the salient facts of his life so far as they can be satisfactorily established. But I am also concerned with O'Hanlon as a symptom of the disordered condition of Ireland in the seventeeth century, as the product of forces which had been working a revolution in Irish life since the reign of Henry VIII. Accordingly, I propose, first, to outline the history of land-confiscation in Ireland from about 1550 to 1665, i.e., from the proto-plantation of Leix and Offaly to the Restoration land-settlement; secondly, to explain the rise and progress of the tories in the seventeenth century; and thirdly, against this background, to present the career of Redmond O'Hanlon. I shall conclude with a brief account of the Redmond O'Hanlon of legend, as distinguished from the O'Hanlon who can be reconstructed from authentic historical evidence.

1. Land-confiscation in Ireland, *c.* 1550—1665.

The Geraldine revolt of 1534 had set an end to a whole epoch of Anglo-Irish independence; its suppression marked the beginning of an epoch of conquest which, with some interruptions, was prosecuted by the English government till the whole island was for the first time reduced to obedience. That achievement, completed in the reign of James I, had involved the eradication of the overgrown powers of the Anglo-Irish feudal magnates, and the destruction of those virtually independent native principalities which, at the beginning of the sixteenth century, covered about two-thirds of the whole island. The progress of English authority brought with it the ruin of old Irish civilization. The brehon law had to yield before the all-embracing law of England. The old relationship of the native Irish to their chiefs was abolished, and their former connection with the soil was transformed.

Of the changes introduced by the Tudor conquest, those which effected the ownership of land were amongst the most far-reaching. The policy of plantation, first applied to Leix and Offaly in the reign of Mary, and extended to a large area in Munster after the suppression of the Desmond rebellion in 1583, had the immediate effect of transferring the ownership of the soil from the native occupiers to new English proprietors, or "undertakers," whose business it was to colonise it on conditions specified by the crown.(1) The fundamental object of this policy was the establishment of a loyal and obedient English population on territory from which the native Irish were to be expelled, and the recovery of such territory from Irish " barbarism " to English " civility and religion." By a combination of state action and private enterprise the ideal of complete anglicisation was to be achieved. Such expectations were not wholly realised in the Tudor plantations. Leix and Offaly were soaked in blood before the O'Mores and O'Connors were finally battered into submission. In Munster, it was soon found that the new proprietors were merely exploiting the confiscated land without regard to the interests of the crown. The native occupiers, being prepared to pay exorbitant rents in order to remain on their former lands, proved more acceptable tenants to many undertakers than English settlers. The chief result of the plantation in Munster was the creation of a new landlord class, while the native Irish remained to serve the planters as cultivators of the soil and payers of rent. None the less, though neither in Munster nor in Leix and Offaly had plantation been an unqualified success, and though attempts at plantation in Ulster had been completely foiled by native resistance, the policy of plantation, at the opening of the seventeenth century, was accepted by English statesmen and administrators in Ireland as a standard remedy for the Irish problem.

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(1) W. F. T. Butler, *Confiscation in Irish History*, ch. I.

Studied from the point of view of land-confiscation, the first half of the century that followed the Tudor conquest is the period of most catastrophic change. The reign of the peace-loving James I witnessed plantations on a far larger scale than the whole of the preceding century; plantations carried out with a far more flagrant disregard of elementary principles of justice. In six of the nine counties of Ulster, a colony of British settlers was intruded over the heads of the native population, and there were similar, though less ruthless, confiscations in parts of Leinster and Leitrim.(1) In Ulster, as in Munster, the expulsion of the Irish from the lands of the British undertakers and their segregation within specified areas were primary objects of the crown but were never accomplished. A small proportion of the confiscated lands, estimated at one seventh the whole, was, it is true, assigned to certain " deserving " Irish. But for the great majority of the Ulster Irish, the plantation meant their degradation to the status of tenants-at-will on the lands which they regarded as their own. It was remarked by the Lord Deputy, Chichester, himself, at the very outset of the plantation, that many of the natives would rather die than be removed to the reservations assigned to them or seek new quarters elsewhere; instead they strained every nerve to gratify the undertakers in the hope of remaining in the places of their birth and ultimately of cutting their landlords' throats.(2) Increasing rents and increasing impoverishment intensified the wretchedness of their condition. Ulster was in a state of smothered rebellion in the thirty years before rebellion blazed out in 1641. But the victimised Irish were not the only class aggrieved by the plantations. The old English colony in Ireland, the men of the English Pale, who had remained preponderantly catholic in spite of age-old traditions of loyalty, saw in the influx of new protestant colonists a threat to their political influence as well as to their religion and ultimately their land. So in 1641 the two ancient enemies, the Anglo-Irish and the old Irish, united by common grievances, went into rebellion together.(3)

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(1) Butler, op. cit., ch. II-III.

(2) *Calendar of State Papers, Ireland,* 1608-10, pp. 502-4, 525-7.

(3) See Carew's " Discourse on the Present Estate of Ireland, 1614," in *Calendar of the Carew MSS.*, 1603-24, pp. 305-10.

In 1641, it is estimated that half the soil of Ireland was still in the possession of the catholics, Irish and Anglo-Irish. The outcome of the ensuing struggle, immensely complicated as it was by the English civil wars, was the most sweeping confiscation in Irish history. When Cromwell's conquering sword put an end to eight years of confusion and violence, the price, at once of rebellion against English authority and of support of Charles I, was exacted. The victims were mainly the catholics who had held land before 1641. About eleven million acres were confiscated, of which only about half a million represented land formerly belonging to protestants. Compensation for a portion of their forfeited estates was found for a certain class of catholics in Connaught and Clare, which were isolated from the rest of the island by a military cordon. Outside the area there was an almost complete extirpation of catholic proprietors. But the mass of the native population, apart from the large number of able-bodied men who were allowed to take service in continental armies, remained to form an embittered tenantry to a new wave of protestant planters.(1)

The Cromwellian settlement was to some extent modified in favour of the catholics on the collapse of the protectorate and the restoration of the monarchy in 1660. Some of the greater catholic proprietors, such as Clanricarde and Antrim, leading catholic lords of the Pale, and others, who had been expropriated as royalists rather than as rebels, recovered all, or part, of what they had lost under the commonwealth. But the new Cromwellian proprietors kept the greater part of their booty, and the bulk of the catholic ex-landlords, despite Charles II's clear obligations to them, were left unrestored. It amounted to this, that whereas in 1641, catholics owned about one half of the soil of Ireland, after 1665 they owned probably between one seventh and one eighth. Of the numerous catholic small-holders and lesser gentry who had been in possession of land in 1641, the great majority had disappeared; so too, such great catholic landowners as MacCarthy Reagh and O'Sullivan Bere of Cork, O'Connor Don and O'Connor Sligo in Connaught, and Magennis in Down, had lost everything.(2) The foundation of protestant ascendancy had been firmly established. The process begun with the plantation of Leix and Offaly was almost complete. The bulk of the population was Irish and catholic, but the owners of the soil were overwhelmingly British and protestant.

2. The rise and progress of the tories in the seventeenth century.

The word tory does not seem to have been used in English official documents before 1646,(3) but toryism, the natural outcome of the plantation policy, had been a factor in Irish history from the time when the O'Mores and O'Connors began the hopeless struggle to expel the English intruders from Leix and Offaly. The planting of the six counties in Ulster, involving as it did a more extensive expropriation of the native occupiers than any yet attempted, generated an army of rustic outlaws. The conclusion of the great O'Neill rebellion had deprived large numbers of the most spirited and reckless Irish of their usual employment. In Ulster, the control which their hereditary leaders were able to exercise over these "swordmen" ceased with the flight of the earls (1607), and the great confiscation which was presently set on foot roused their defiance. The Irish solicitor general reckoned that there were at least 20,000 swordmen in Ulster in April 1609.(1) It was from this class that the most serious resistance to the plantation was expected. The government therefore proposed that some should be removed to parts of Connaught and Munster where they would be under the jurisdiction of magnates such as Clanricarde, Thomond and Ormond; some should be impressed and transported abroad to serve in foreign armies; the rest should be confined in specified areas within the escheated counties, according to the general plantation scheme, which prohibited the British undertakers from accepting the natives as tenants, but allowed the servitors to do so.(2) By such means it was hoped to eliminate the most active sources of turbulence in Ulster. But the task proved to be beyond the government's powers. To the Ulster natives at large, the news of the treatment in store for them was " as welcome as sentence of death."(3) Some nine hundred of the leading swordmen were rounded up and despatched for service in Sweden in the autumn of 1609, but the attempt miscarried and ended in the speedy return of the transportees to various parts of Ireland. In 1610, a second attempt was made, and some two hundred swordmen were shipped to Sweden.(4) But far larger numbers withdrew to the woods and stood " upon their keeping."(5) Thereafter they became the scourge of the new settlers, making robbery and violence their profession. Their less spirited countrymen remained on the lands they had once owned, to become little better than serfs to the new proprietors. The government's segregation scheme was not carried out. There was no wholesale transference of natives to defined areas, there to become islanded by a sea of British immigrants. Just as in Munster, the economic interests of the new proprietors ran counter to the intentions of the state. The undertakers, finding it more profitable to retain the natives as tenants than to import large numbers of colonists, virtually co-operated with the natives in stultifying the government's plan for their removal. But continual rack-renting gradually impoverished these natives, aggravated the bitterness with which they regarded their supplanters, and helped to replenish the ranks of the swordmen or wood-kernes, as they came to be generally called.

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(1) Butler, op. cit., ch. V. J. P. Prendergast, *Cromwellian Settlement of Ireland, passim.*

(2) Butler, op. cit., ch. VI.

(3) Historical Manuscripts Commission, *Ormonde MSS.*, N.S., 1. 105.

The extermination of wood-kernes became a preoccupation of the planters and one of the normal activities of the state. Thus when a programme of legislation for the first parliament of James I's reign was being compiled in 1611, a measure was included " whereby the kindred of such as run into the wood and stand upon their keeping as rebels, shall submit themselves to justice, upon pain that if their kindred bring not in those rebels by a time, then the people in the baronies within which such people are relieved shall bring them in to submit themselves to trial within a time, or else discover the relievers and bring them to justice upon a pain."(6) One of the English undertakers in Fermanagh, Thomas Blenerhasset, in a pamphlet which he published in 1610, speaks of the wolf and the wood-kerne as the most serious dangers to the British settlers in Ulster. He recommended, *inter alia*, that the colonists should organise periodic man-hunts to track down the human wolves to their lairs, " and no doubt it will be a pleasant hunt and much prey will fall to the followers."(1) Taking a long stride through the seventeenth century, we shall find very similar language used, in corresponding circumstances, of the tories. Thus, on 26 March 1679, a proclamation was issued against tories and robbers and "for seizing their nearest relations, that is to say the wives, fathers, mothers, brothers and sisters of such of them as shall be out upon their keeping, that is not amenable to law, and committing them to close prison until such tories shall be killed or taken . . . . ."(2) Again, in the spirit of Thomas Blenerhasset, Sir William Stewart, of Newtownstewart, County Tyrone, wrote to Ormond, the viceroy, on 17 March 1683: "There was never such a winter for country sports as the last and I have enjoyed them in much perfection. I had very good hawks and hounds but we have not had more success in any sport than Tory hunting. The gentlemen of the country have been so hearty in that chase that of thirteen in the county where I live in November, the last was killed two days before I left home."(3) In fact, the tories of the second half of the seventeenth century were the wood-kernes of the first half.(4)

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(1) *C.S.P.I.*, 1608-10, pp. 196-7.

(2) *Cal. Carew MSS.*, 1603-24, pp. 48-9.

(3) *C.S.P.I.*, 1608-10, pp. 479.

(4) Ibid., pp. 300, 303-6, 458-60, 496-7.

(5) Ibid., pp. 296, 496.

(6) *Cal. Carew MSS.*, 1603-24, p. 162.

The problem of the wood-kernes who stood upon their keeping was not confined to Ulster, but where it was present in other parts of Ireland, these were usually districts, such as Wexford and Leitrim, in which plantations had been undertaken.(5) Ulster, however, may be regarded as the peculiar sphere of the wood-kernes in the period before 1641. There, agrarian grievances rankled most fiercely among the native population, while uncleared woods and untracked mountains afforded excellent bases for brigandage. The county of Armagh, much of which was thickly wooded and which included the difficult mountainous district around Slieve Gullion, was a breeding-ground of wood-kernes.(6) The great ridge of the Sperrins and the woods of Loughinsholin constituted a central fastness from which wood-kernes conducted their plundering expeditions against colonists in Londonderry and Tyrone. It was in this region that the conspiracy of 1615, the one attempt at organised revolt prior to 1641, was staged.(7)

When we advance into the 'fifties of the century we find, as a result of the Cromwellian confiscation, that the existence of the wood-kernes, or, as we may now call them, tories, has become a problem common to the whole island. Eight years of rebellion and civil war had left Ireland swarming with swordmen. Though some forty thousand of them emigrated to the continent, a multitude remained to form a class of irreconcileable and desperate outlaws, who established themselves in the wildest parts of the country and thence preyed on the usurpers of their former fields.(6) In all four provinces, tory bands, often under the leadership of some dispossessed chief or gentleman, conducted an organised campaign of violence and terrorism. The commonwealth government made great efforts to suppress them. The rule was established in February 1650, that all the Irish of the barony in which tories had committed robbery or outrage, and of any barony through which tories had passed, should make good the damage inflicted, unless within a given time they brought in the criminals.(1) In April 1655, a proclamation announced that if tories guilty of outrages were not apprehended within twenty-eight days, four Irish of the neighbourhood were to suffer transportation to the English plantations in America, and all the Irish in the barony were to be transplanted.(2) In October 1655, rewards were offered, ranging from £5 to £50, for the heads of certain prominent tories, while for the apprehension of any tory, dead or alive, a sum of 40/- would be given to a civilian and 20/- to a soldier.(3) On this basis, a considerable trade was done in the killing of tories.(4) But one great obstacle in the way of the authorities was that the Irish population as a whole sympathised with, and secretly assisted, the tories; another was that English soldiers and planters were no match for nimble desperadoes who knew every inch of the most inaccessible country.(5) So the government would bribe tories by offers of pardon to track down and kill fellow-tories, or for similar considerations would purchase the services of Irishmen to protect a given district from tory attack.

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(1) *A Direction for the Plantation in Ulster*, quoted in R. Bagwell, *Ireland under the Stuarts*, i. 82-3.
(2) H.M.C., *Ormonde MSS.*, ii. 257 ; N.S., v. 28.
(3) H.M.C., *Ormonde MSS.*, N.S., vi. 544-5.
(4) See *Montgomery MSS.* (ed. Rev. G. Hill), pp. 117-8.
(5) Prendergast, *Ireland, 1660-90*, p. 58 ; Bagwell, *Stuarts*, i. ch. IX.
(6) *C.S.P.I.*, 1611-14, pp. 254-5.
(7) Bagwell, *Stuarts*, i. 144-6.
(8) Prendergast, *Cromwellian Settlement*, pp. 331-2, 340-1.

All such measures were of no avail to root-out the evil. The remedy lay in mitigating the fundamental grievance of land confiscation, which the Irish at large could only regard as flagrant injustice. To the Cromwellian government, the great confiscation was a fitting retribution for the rebellion of 1641. But that rebellion had been in part the outcome of confiscation in Ulster thirty years before. And if no allowance could be made for this fact, a very large number of dispossessed Irish could not but believe that when Charles II came into his own, their past services to the monarchy would be rewarded. But as we have seen, the Restoration, so far as Irish land was concerned, was a restoration only of the royalist magnates and comparatively few others. The pathological conditions in which toryism was bred continued into the reign of Charles II and far beyond. Legislation against tories is to be found more than a century later.(6) English policy in Ireland from the middle of the sixteenth century to the Restoration settlement had effectively divorced law and justice in the minds of the Irish. The nemesis was that consciousness of injustice became a heritage of the Irish, that with them lawlessness did not necessarily bear any moral stigma. So long as that state of mind endured among such a people, toryism in one form or another would continue, and tories would be regarded as popular heroes rather than as criminals.

3. Redmond O'Hanlon.

The interval between the Restoration and the Williamite reconquest may be said to be the classic period of the Irish tories. The Cromwellian settlement was still a present memory among the dispossessed Irish and their descendants; the spirit of resistance was not yet extinguished, as it was to be after the triumph of the Williamites in 1690-1. The annals of toryism in this period are highly coloured by the exploits of a number of individuals, foremost of whom are Redmond O'Hanlon, Richard Power and the three Brennans. The tories were a source of intermittent disturbance and we find frequent proclamations issued by the government against them as a class and also against particular tories.⁽¹⁾ As an example of the former type may be cited the proclamation of 1679, already mentioned, which announced that the crimes of the tories would be visited on their relatives. In a proclamation of the latter type, dated 14 December 1674, there appear the names of " Redmond O'Hanlon of Tanderagee, in the county of Armagh, yeoman," and " Laughlin MacRedmond O'Hanlon of Killeany,⁽²⁾ yeoman." They and other persons named are given till the following February 1 to submit themselves to justice, or thereafter to be treated as outlaws, and anyone who will bring them in, alive or dead, shall have £10 reward for each apprehension.⁽³⁾ This is the first authentic appearance of Redmond O'Hanlon in history. A Laughlin O'Hanlon, presumably the Laughlin MacRedmond mentioned above, had already come under official notice. At Dundalk assizes, in 1669, he was convicted and sentenced to death for the theft of a horse. Being then only 18 years of age, he petitioned for mercy, promising to become a " new man." The petition was granted, and Laughlin escaped the gallows.⁽⁴⁾ Five years later, as we have seen, Redmond and Laughlin had entered the tory profession. Our next authentic reference to either of them is in 1676, when a new proclamation was issued for bringing in the body, alive or dead, of Redmond O'Hanlon.⁽⁵⁾ Again there is a complete blank till in October 1678, we find direct evidence that Redmond had become one of the most formidable tories in the kingdom.⁽⁶⁾

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(1) Ibid., pp. 334-5.
(2) Ibid., pp. 337-8.
(3) Ibid., p. 343.
(4) Ibid., pp. 343-4.
(5) Ibid., pp. 337, 344.
(6) Ibid., pp. 351-2. W. E. H. Lecky, *History of Ireland*, i. 354-6.

So much and no more we can gather from official records. But there is a comparatively detailed account of Redmond's life before he became a tory, in a pamphlet, published in 1682, entitled: *The Life and Death of the Incomparable and Indefatigable Tory Redmon O'Hanlyn, commonly called Count Hanlyn.*⁽⁷⁾ It is in the form of a letter, dated 1 August 1681, addressed to a Mr. R. A., in Dublin, and written by someone who speaks of his place of residence as " this Barren and Remote Country," someone who seems to have had local sources of information about O'Hanlon and his band. According to the *Life and Death*, as I shall call the pamphlet, Redmond was the son of Laughlin O'Hanlon and was born near Poyntzpass, county Armagh, in 1640. This is our sole contemporary statement of the birth and parentage of Redmond. There is nothing intrinsically improbable about either the date or the place of birth. Redmond was evidently a man in the prime of life when he was killed in 1681. There is a definite local tradition that he was born in the townland of Aghantaraghan, just south of Poyntzpass. His burial place is traditionally stated to be Relicarn graveyard, near Scarva, in the townland of Terryhoogan, and only a few miles north of Poyntzpass.⁽⁸⁾ In the proclamation of 1674, already mentioned, he is described as of Tanderagee, which is not far from Relicarn. These places lie in the barony of Orior, where the sept of O'Hanlon ruled before the plantation in Ulster; Tanderagee was once an O'Hanlon stronghold. Nothing definite is known of Laughlin O'Hanlon, the alleged father

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(1) Catalogue of Proclamations, 1661-1767, in *23rd Report of Deputy Keeper of Public Records in Ireland* (1891), pp. 32-5, 39-40.

(2) Presumably for " Killeavey."

(3) H.M.C., *Ormonde MSS.*, ii. 342-4.

(4) H.M.C., *10th Report*, App. V (Ormonde MSS.), p. 106.

(5) *23rd Report of Deputy Keeper of Public Records in Ireland*, p. 33.

(6) H.M.C., *Ormonde MSS.*, N.S., iv. 213.

(7) Copy in British Museum, G.5580.

(8) I am indebted for this information to Mr. T. G. F. Paterson, curator of the County Museum, Armagh.

of Redmond.(1) But without entering into the nebulous speculations regarding Redmond's ancestry, we may safely assume that he came of the O'Hanlons who had formerly been dominant in Orior, who had lost much of their estates at the time of the Ulster plantation, and who were almost wholly deprived by the Cromwellian confiscation. We may also suppose, though with less assurance, that resentment at the eclipse of his house was a motive force in driving the young Redmond to a life of outlawry. Nothing of this appears in the *Life and Death of O'Hanlon*, where Redmond is represented merely as a selfish, sly, insinuating knave, who showed criminal tendencies from his earliest years. But the anonymous author, who clearly belongs to the protestant, landowning class, naturally has no interest in the essential causes of toryism, and we need not be surprised that he offers no explanation of Redmond's career as a tory except original sin.

The salient facts in Redmond's progress towards the profession of tory, as recounted in the *Life and Death*, are these. He received some education in an English school, and thereafter secured employment as foot-boy to a neighbouring magnate, Sir George Acheson of Markethill. In Acheson's service, he stealthily cultivated the rudiments of thieving and highway-robbery, facilitated by exceptional skill in disguise. Discovered in the act of trying to sell a stolen horse, to which he had affixed a false tail, he was obliged to quit Armagh. He then engaged himself as servant to a " Fanatick Teacher," by which is evidently meant a minister of one of the Independent congregations that flourished in Ireland during the Cromwellian period. So well did Redmond adapt himself to his changed circumstances that his master made him clerk to the congregation, and in this capacity he remained till the Restoration, when he judged it safe to return to Armagh. For a time he was a successful collector of poll-money, and did not scruple to squeeze the poor. Later, as farmer and receiver of hearth-money—" an undertaking that has proved fatal to every man that has been so concerned "—he found it impossible to discharge his contract. His new respectability had gained for him a wife with a considerable dowry, and when all this had been spent in making up financial deficiencies. he was threatened with imprisonment for debt. In his desperation, Redmond contemplated turning outlaw, for which he had the important qualification of a detailed knowledge of the countryside, gained as a revenue official. The opportune death of his wife having removed his strongest deterrent, he absconded. Lurking in the mountains he presently seized two horses from a thief who had stolen them from a Mr. Pakenham of Meath, and foiled all the latter's efforts to recover them. But he was only impelled into taking up active robbery as a profession by the solicitations of his fiery kinsman, Laughlin O'Hanlon, who persuaded him to enter into " an Offensive and Defensive League, against the King, the Lawes, and all honest People." The pact was sealed by Laughlin's giving his sister in marriage to Redmond. Soon afterwards, however, Redmond was surprised and committed to Armagh gaol, where his career would have ended had he not contrived by trickery to escape and return to the mountains. " And now having doubled his Crime by breaking of Prison, and despairing of mercy or pardon, he resolved to abandon himself to all Lewdness and to become a perfect bird of Prey . . . ." He organised a band of followers and, with Slieve Gullion and its neighbourhood as a centre, conducted systematic and often ingenious robberies in the three counties of Armagh, Monaghan and Down, while gaining an acknowledged position among the rural population as protector of whoever would pay him regular tribute. He eluded all attempts of the military to capture him, and his fame spread throughout Ireland, and even beyond, so that he was mentioned in a French gazette as "Count Hanlyn."

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(1) Rev. L. P. Murray believes that his father was not Laughlin but Redmond (*Louth Archaeological Journal*, vii. 342-3). This view, however, depends on the assumption that the Laughlin MacRedmond named in the proclamation of 1674 was Redmond's brother, whereas it is likely that he was his brother-in-law. Note also that, in the proclamation, Redmond is described as of Tanderagee, but Laughlin as of Killeavey.

The foregoing narrative has no independent support apart from the proclamations of 1674 and 1676, but it is here offered as being the earliest, though an obviously prejudiced, attempt to fill in what is otherwise unknown. It is certain that Redmond, along with Laughlin O'Hanlon, had gone on his keeping in 1674 and had attracted the notice of the government. In October 1678, he is described by a tory-hunter of county Derry, in a letter to the lord lieutenant, Ormond, as "Count Hanlon," and his pre-eminence among the tories of Ulster is acknowledged.(1) In 1678-9, we are given glimpses of his activities by one who was only too well acquainted with them.

Edmund Murphy was the catholic priest of the parish of Killevey, in south Orior, the very heart of O'Hanlon's country. He has gained some prominence in history as one of the witnesses in the popish plot, and particularly in the proceedings which led to the judicial murder of the catholic primate of Ireland, Oliver Plunket (1680-1).(2) Part of the evidence which he gave in London was published in 1681 as a pamphlet, entitled *The present state and condition of Ireland . . . by Edmund Murphy . . . one of the first discoverers of the Irish plot.*(3) He had been arrested in 1679 by two officers, Lieutenant Henry Baker and Ensign John Smith, who lived near Dundalk, on a charge of criminal connection with the local tories. At Dundalk, he fell in with William Hetherington, a lying scoundrel who subsequently became Lord Shaftesbury's stage-manager for the Irish version of the plot, and a familiar of Titus Oates. Hetherington was now on the look-out for likely information, and Murphy, to save his own skin and take revenge on Baker and Smith, offered himself as a serviceable tool. It was thus that Murphy was brought to Shaftesbury's notice, and that he eventually appeared in London in the new rôle of informer against his own archbishop. But rascal though he was, he ultimately reconciled against swearing away the life of the primate and confessed that Hetherington had set him on to the course he had taken. His pamphlet purports to give an account of how he discovered Plunket's alleged treason, but it contains no really damaging statements against the primate, and is mainly a narrative of Murphy's dealings with the tories of his district. In a sense it gives us inside information, for though he professes to be an arch-hunter of tories, it is clear that Murphy was little better than a tory himself.(4) Obviously we can only accept the statements of such a man with great reserve, but his general picture of lawlessness and barbarity in the region about Slieve Gullion carries conviction.

About 1678, for reasons that he does not explain, Murphy stood out as a bitter enemy of Redmond O'Hanlon and his band. He denounced them from the pulpit, whereupon Redmond proclaimed that anyone attending his church would be punished by the loss of a cow for the first offence, of two cows for the second, and of his life for the third. One of Murphy's parishioners thus lost two cows, and another was murdered. Murphy then hired a curate, avoided his own parish, and schemed persistently to destroy his enemy. He found his efforts thwarted by the fact that Lieutenant Baker and Ensign Smith acted as O'Hanlon's accomplices, and that the soldiers in the neighbourhood were generally inclined to be lukewarm in the pursuit of the tories. However, he met a Captain William Butler, who was anxious to run O'Hanlon to earth, and with him concocted a plot by which Redmond was to be lured into an ambush by one Cormack Raver O'Murphy. O'Murphy had been proclaimed along with Redmond in 1674,(1) and had been one of Redmond's men, but, becoming ambitious, had started a rival band. He had been roughly handled by Redmond for molesting three of the latter's tributaries. These three were Scots living in Killevey parish, and they complained to Redmond that they had been plundered though they held passes from him. Redmond soon swooped down on Cormack, forced him to restore his plunder to the three Scots, and threatened to deliver him to the nearest justice of the peace until he undertook to buy his release for £20. With the promise of a pardon and twenty guineas, Cormack attempted to trepan his former chief. Twice he was baffled by the superior cunning of Redmond and the failure of the military to co-operate. Unfortunately for himself he took into partnership a tory called Neale, who passed on his secrets to Redmond. The latter ordered Cormack to be killed, and killed he was by Neale outside Ensign Smith's house. Edmund Murphy then planned to capture Neale by having word sent to him that Cormack's death was regarded as accidental, and inducing him to attend the burial. Neale did so, and when the burial was over, accepted an invitation of the deceased's brothers, William and Hugh O'Murphy, to drink at an ale-house. Then he grew suspicious and insisted on departing, whereupon the O'Murphy brothers set on him and he barely escaped. Edmund Murphy then made the brothers promise not to let Cormack's death go unavenged. With Hugh O'Murphy acting as a spy on the tories, new schemes for ambushing Redmond were hatched. But a valuable opportunity was thrown away through the absence of Captain Butler from Dundalk at a critical moment. On his return with Sir Hans Hamilton, an Armagh magistrate, Edmund Murphy accused Baker and Smith of being in league with the tories. Baker and Smith retorted by having him clapped into Dundalk jail on precisely that charge.(2) Thereafter his career does not concern us.

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(1) H.M.C., *Ormonde MSS.*, N.S. iv. 213.

(2) Bagwell, *Stuarts*, iii. 135-7.

(3) Reprinted with introduction and notes by Rev. L. P. Murray in *Louth Archaeological Journal* (1929-32), vii. 335-81.

(4) Murphy's pamphlet, *ut supra*. H.M.C., *Ormonde MSS.*, N.S., vi, 68, 70-1. *Calendar of State Papers, Domestic*, 1679-80, pp. 478, 491, 505-6, 516 ; 1680-1, pp. 313, 318, 327, 502, 623-5, 627.

From the spring of 1679 till his death two years later, we have a genuine, though meagre, documentary basis for Redmond's career. While Murphy was plotting his downfall by stealth, joint action was being taken against him by landowners in the three counties of Down, Armagh and Monaghan. In May 1679, a force of thirty men, to be paid at the rate of ninepence a day by a voluntary contribution for three months, was being raised to patrol the country. Redmond had then narrowly escaped capture, had been wounded and fled to Ram's Island.(3) In the course of the summer he was hotly pursued and the Glen Woods, his chief place of retreat, were cut down.(4) In August he was robbing in Fermanagh, and was hunted into Connaught by a party of militia.(1) In September 1679, an incident occurred which gave O'Hanlon a new and dangerous notoriety. Henry St. John, grand-nephew of Sir Oliver St. John, lord deputy of Ireland (1616-22), had inherited the rich manor of Tanderagee, and in 1679 he and his wife were living prosperously on their estate. On September 9 he was killed near Knockbridge by some of O'Hanlon's men.(2) Details of the tragedy, which strangely enough is mentioned neither by Edmund Murphy nor by the writer of the *Life and Death*, appears in the sermon delivered at St. John's funeral by Rev. Laurence Power, rector of Tanderagee.(3) St. John, it seems, had taken up a coldly defiant attitude towards the local tories—" a pack of insolent bloudy outlaws," who " had so riveted themselves in these parts, what by the interest they had among the Natives and some English too, to their shame be it spoken, that they exercise a kind of separate Sovereignty in three or four Counties . . . ." Their chief, Redmond O'Hanlon, is described as " a cunning dangerous fellow who though Proclaimed as Outlaw with the rest of his Crew and summs of Money upon their heads, yet he raigns still and keeps all in subjection so far that 'tis credibly reported, he raises more in a year by contribution à la mode de France, than the King's Land-Taxes and Chimney-Money come to; and thereby is enabled to bribe Clerks and Officers, if not their Masters, and makes all too much truckle to him." St. John disdained to have any dealings with the tories, not even to recover a stolen horse and cow, but on the contrary made open war upon them. His animosity must have been sharpened when his only son, at the age of nineteen, died as a result of " a surfeit of heat and cold " caught in a too-strenous tory-hunt. St. John thus made himself obnoxious to the tories, but also, Power alleges, to those who secretly assisted and relieved them. On the fatal day he was out riding, unarmed, with Power and a man-servant, when he was seized by tories. Their leader, who was evidently not O'Hanlon, swore that if a rescue was attempted he would shoot the prisoner. Rescuers did appear, and St. John received two bullets in his forehead.

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(1) H.M.C., *Ormonde MSS.*, ii. 342.

(2) Murphy's pamphlet, *ut supra*.

(3) *C.S.P.D.* 1679-80, p. 161.

(4) Ibid., p. 241. The Glen Woods, I am informed by Mr. T. G. F. Paterson, lay to the south of Poyntzpass.

Power concluded his address significantly with an exhortation to his listeners to rouse themselves and rid the country of a shameful plague. " I must make some reflection upon this country too concerning these skulking scoundrels that are the disturbers of the best planted country in the Kingdom, no part of Ireland having so many inhabitants yet no place so pestered with these vermin. And you know, gentlemen, the obloquy you lie under, as if some of you did shelter and protect them. I confess I abhor the thought of it that English people and Protestants should harbour such pernicious vipers in their bosom, yet it is certain some of you do, and that of the better sort too, or else some half-a-score of ruffians could never lurk so long among you, which is such a prodigious shame that you can never wipe off the infamy of it. Pardon me, sirs, if I express my just resentment against such dealing. I reflect upon no individual person but this I can boldly say in front of you all, that I have heard many of you accuse one and another for harbouring these infamous rebels and that they help to furnish your kitchens and tables."

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(1) *C.S.P.D.*, 1680-1, p. 89.

(2) *C.S.P.D.*, 1679-80, p. 241.

(3) *The Righteous Man's Portion . . . by Laur. Power . . .* London, 1680. Copy in National Library, Dublin. MS. copy in Armagh Public Library.

A brief report of St. John's murder found its way into at least two London newspapers,(1) and from this point onwards, there are occasional references to Redmond and his band in the London press. Soon after the St. John affair, Redmond was in Leitrim, where he robbed a merchant of nearly £100 within a few miles of the castle.(2) In October, he seems to have been in Roscommon,(3) but before the end of the year was back again in his old haunts.(4) In Down, six robberies occurred in October, when the tories were reported to have grown more numerous. A meeting of the three counties' magistrates was held at Hillsborough in that month to provide for the volunteer defence force. Four local magnates, Sir Hans Hamilton, Sir George Acheson, Sir George Rawdon, and William Hill, were present. Money was subscribed for rewards to be offered for the heads of tories—£30 for each of the O'Hanlons, and £20 for certain others.(5) These measures can have had little effect, for at the end of 1679, an anonymous letter-writer from Tanderagee, probably Rev. Laurence Power, declared that no one could stir abroad without danger of being taken or killed. Redmond and two others had lately been chased by two young men, tenants of Mrs. St. John's, who had succeeded in recovering some stolen property. But that same night their father's house was burnt down and his corn destroyed by the tories. The soldiers stationed close by at Tanderagee were called in, but they pretended to believe that their informant was lying until the tories had gone. It was evident, said the writer, that they had confederates among the soldiers. Sir Toby Poyntz, of Poyntzpass, a justice of the peace, and his son, Captain Charles Poyntz, who was in charge of the local garrison, were suspect. The one should be removed from the commission, and the other, with his company, be replaced by an officer and men with no local connections. Also, all the passes between the counties of Armagh and Down—Fathom Castle, Tusker, Poyntzpass, Scarva, and Knockbridge—should be guarded, and all boats in the river from the mouth of Carlingford Lough to Knockbridge should be taken away.(6)

The foregoing letter was intended to be brought to Ormond's notice, and it probably was, for the viceroy from now onwards seems to have given close attention to the O'Hanlon problem. Redmond and Laughlin had again been proclaimed some time in 1679.(7) On 21 January 1680, a new proclamation appeared offering £100 for the head of the former and £50 for that of the latter. A Captain Trevor Lloyd was at the same time commissioned by the viceroy to draw such detachments from the neighbouring garrisons as he judged necessary to hunt the tories.(8) The garrisons of Tanderagee and Loughbrickland were reinforced by men from Lisburn. Sir George Rawdon, who was in command at the latter, contrived to get the heads of the two tories who killed St. John, and was hopefully plotting to surprise O'Hanlon.(9) Seven tories were killed in June, and Redmond himself had a narrow shave. Captain Lloyd seems to have acted with energy.(10) According to the *Life and Death*, which can here be linked up with the evidence derived from archive sources, Redmond was driven by Lloyd and his men down to the shore of Carlingford Lough, " where by his wits he defected the Industry of a Little Army; for perceiving a small Boat near to the shore; he rode fair and softly toward it, and then abandoning his Horse and Arms, he call'd to the Boatman, and told him that he was a sickly man, and advised by his Physitian, to go two or three Leagues into the Sea, and if he would Row him out of the Harbor, to try if he could be Sea-Sick for an Hour or two, he would give him ten shillings for his pains; the poor Boatman was overjoy'd at the proffer, and quickly computing what an Advantage it was to gain that by an Hours work, which a weeks toyl in fishing would hardly have advanced, he admitted the *Count* into his Boat, and row'd out from the shore, which they had not long forsaken, before the *Count* could perceive a multitude of men coming down from the Mountains, whom he well knew to be his Persecutors: and fearing that another Boat might be procured to follow his, he spok to the skipper to row with all hast to the other side of the Headland, which the poor man being unwilling to do (Least the wind might drive him into the main Sea) the *Count* took out his Pocket Pistol, and with a thundring Oath assured him, that if he did not presently obey him, he should never return to Land: the poor man was forced to comply, and the *Count* vouchsafing to put his hand to an Oar, in a short time they were got quit out of sight, and then rowing two and fro under cover of the High Land all the day, they came at Night into a little Creek, and the *Count* having Nobly paid for his passage, traveled thro byways, and got safe to the house of one of his Harborers."(1)

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(1) *Domestic Intelligence* (printed for Benjamin Harris, London), no. 29, 14 October 1679 (British Museum, Burney Collection, vols. 81, 83). *The True Domestic Intelligence* (printed by Nathaniel Thompson, London), no. 31, 21 October 1679; no. 57, 20 January 1680 (Burney, vol. 83).

(2) *C.S.P.D.*, 1679-80, p. 241.

(3) H.M.C., *Ormonde MSS.*, N.S., v. 223.

(4) Ibid., p. 254.

(5) *C.S.P.D.*, 1679-80, pp. 258-9.

(6) H.M.C., *Ormonde MSS.*, N.S., v. 254-5.

(7) *23rd Report of Deputy Keeper of Public Records in Ireland*, p. 39.

(8) Ibid., p. 35. *C.S.P.D.*, 1679-80, p. 381.

(9) Ibid., pp. 368-373.

(10) Ibid., p. 512.

But it was not by any frontal attack that Redmond was at last removed. The method of Edmund Murphy proved effective in the hands of abler men. Ormond's attention was drawn to its possibilities in October 1680, when secret communications between Rev. Laurence Power and a tory elicited detailed information as to Redmond's immediate plans. He and his band had arranged to join forces with tories from Derry and Tyrone in a plundering expedition on the borders of Connaught. They were all to wear grey coats lined with red, so that they could look like civilians or soldiers as occasion required.(2) Simultaneously other negotiations were on foot. O'Hanlon was making overtures to the government through Mr. and Mrs. Annesley, of Castlewellan, and also through the bishop of Clogher, for a surrender on terms. Deborah Annesley, who evidently regarded the O'Hanlons compassionately, was the daughter of Henry Jones, bishop of Meath, and to him she and her husband communicated the tories' proposal (Nov. 1680).(3) The bishop appeared to be sympathetic, but he had other irons in the fire. He was deeply involved with Shaftesbury in running the popish plot, and had taken up the cudgels for Edmund Murphy.(4) He supposed that the O'Hanlons either had, or could manufacture, damning information against Primate Plunket, who was accused of having projected a French invasion through Carlingford Lough.(5) So the Annesleys had to inform Redmond's mother-in-law that there was little hope of any pardon for Redmond and Laughlin, that their price had been raised to £200 and £100 respectively, but that the bishop of Meath desired to know " whether Redmond O'Hanlon will be a discoverer of the design for the French invasion here, and who in Ireland are the principal abettors." If he agreed to do so he need not doubt of a pardon and reward for himself and his two brothers, Laughlin and Edmund Bane.(1) This scheme came to nothing, but we lack the satisfaction of knowing whether Redmond refused to play the bishop's infamous game. For the arrangement was accidently disclosed to Ormond who regarded Bishop Jones as a spiteful and false informer and had no intention of allowing O'Hanlon to redeem his crimes by such means.(7)

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(1) There are also notices of the close pursuit of Redmond during Jan.-Mar. 1680, in *The True Domestic Intelligence* (printed by Nathaniel Thompson, London), no. 56, 16 Jan. 1680 ; no. 57, 20 Jan. 1680 ; no. 62, 6 Feb. 1680 ; no. 76, 23-26 Mar. 1680 (British Museum, Burney Collection, vol. 83).

(2) H.M.C., *Ormonde MSS.*, N.S., v. 257, 440-1, 448-9.

(3) H.M.C., *Ormonde MSS.*, i. 52-3 ; N.S., 473-4.

(4) Bp. Jones to Col. Maunsell, 1 June 1680, Carte Transcripts, P.R.O. Dublin, vol. 39, p. 87.

(5) Prendergast, *Ireland, 1660-90*, pp. 115-8. See also *C.S.P.D.*, 1680-1, pp. 623-5 ; 1682, p. 603.

Ormond now himself intrigued to bring about O'Hanlon's ruin. Such details as we have of the plot are contained in two letters; one, dated 27 April 1681, " writ by a Country Gentleman (now in Dublin) to a Person of Quality (his friend) in the Country," and published as a pamphlet in Dublin in the same year under the title *Count Hanlan's Downfall*, and also, *ipsissimis verbis*, in a London newspaper, of 7-11 May 1681 ;(3) the other, of about the same date, from Sir Francis Brewster, a prominent Dublin citizen.(4) The accounts given in these two sources are mutually consistent, agree with what is otherwise known of O'Hanlon's death, and may be accepted as sound. In the spring of 1681, the lord lieutenant requested a gentleman in Dublin acquainted with the north to choose some one on the spot fit to execute a secret and dangerous design. William Lucas of Drumintyan, county Down, was accordingly summoned to Dublin. To him Ormond gave personal instructions as well as a commission, dated 4 March 1681, entrusting him with full power to act effectively against O'Hanlon. Lucas at once applied to a certain Art O'Hanlon, a foster-brother and follower of Redmond, who undertook to kill the latter, receiving written assurance of immunity from arrest for one month from April 3. Art apparently raised no suspicions in Redmond and there was only one other tory present, William O'Shiel, when he shot Redmond dead near Eight Mile Bridge (Hilltown, county Down) on April 25. The killer was rewarded with £200(3) and Lucas with a command in the army.

We have seen that the Rev. Laurence Power, of Tanderagee, alleged that some of the gentlemen of the county were sheltering and protecting the local tories, and that Sir Toby Poyntz and his son Charles were explicitly accused of so doing in a letter probably written by Power. The Poyntzs were conscious of being suspect, and on the death of Redmond, Captain Charles Poyntz hastened to claim a share of the credit. By his own account, he had been in communications with Art O'Hanlon since December 1680, with precisely the same object as that lately accomplished by Lucas. Art O'Hanlon, who had been a servant to Sir Toby Poyntz, had then no connection with the tories, and only associated with Redmond at Charles Poyntz's instigation in order to destroy him. " I am very far," wrote Charles Poyntz to Lieutenant-Colonel Sir William Flower, "from derogating anything from the merits of Mr. Lucas's service . . . . neither I hope will you think that (had the service been done only by my means) I expected any other reward . . . . than that my Lord Lieutenant and you and all good men should see that my endeavour were not wanting for the serving my country, in the ruin of that rogue and all such, which I hope by your means either is or may yet be brought to pass . . . ."(1) It may be suggested that Poyntz protests too much and that his zeal against the tories was belated.

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(1) H.M.C., *Ormonde MSS.*, N.S., v. 535-6. " Brothers " may well mean " brothers-in-law," which is what we should expect if the relationship between Redmond and Laughlin given in the *Life and Death* is correct.

(2) Ibid., pp. 530-1. Ormond to Ossory, 20 July 1680, Carte Transcripts, vol. 39, p. 100.

(3) *The True Protestant Mercury* (printed for Langley Curtis, London), no. 36, 7-11 May, 1681 (British Museum, Burnley, vol. 83). Also notices in *Currant Intelligence* (printed for John Smith, London), no. 4, 3-7 May 1681 (Burnley, vol. 87) ; *Domestic Intelligence* (printed for Thomas Benskins, London), no. 1, 13 May 1681 (Burnley, vol. 87).

(4) T. Carte, *Life of Ormonde* (1736), ii. 512-13.

(5) Prendergast, *Ireland, 1660-1690*, p. 122.

The death of Redmond led to the immediate collapse of his band. Pardons were sought for Laughlin and Edmund Bane by their mother and grandfather, who came to Dundalk for that purpose on May 5. They were told that Laughlin's offences were unpardonable, but that Edmund Bane might be received into mercy if he would act as a setter on his comrades,(2) and this he evidently did. Art O'Hanlon and William O'Shiel were then actively engaged in hunting down their late fellow-tories. Lieutenant William Lucas jubilantly reported from Newry on May 20 that he himself had just shot a tory, was hopeful of four more heads within the next few days, and that by O'Shiel's means six tories had either come in or been killed. About a week later, Ormond was informed from Tanderagee that there was no appearance of tories in Armagh or Down, the remnant having departed to Tyrone.(3) Laughlin O'Hanlon met his end at the hand of a certain John Mullin some time before December 12, when the latter received £50 as a reward.(4)

Redmond O'Hanlon's period of ascendancy was short, extending at the most from 1674 to 1681. It was only after the St. John shooting that his fame spread to England. Though Sir Francis Brewster states that he was mentioned in the French as well as in the English gazettes, there is no reference to him in the British Museum's *Recueil des Gazettes, 1631-1790*,(5) in which Irish news appears from time to time. But there can be no doubt that in Ireland he earned unrivalled notoriety as a tory, and that he sustained the part longer than was considered possible for so marked a man. Brewster described his killing as being " as seasonable a piece of service as had happened in that kingdom for many years . . . So terrible he was in the northern parts, that there was no travelling without convoys. In fine, since the general Rebellion of Ireland all the tories have not done the mischief this fellow hath done, nor put the Army to so much trouble in attending and pursuing, as after him and his party . . . ." He had evidently great powers of physical endurance, a capacity for organisation and leadership, nimble wits, and exceptional cunning. He could doubtless depend on the sympathies of the Irish peasantry, and probably had secret connections with some of the local gentry and soldiers. From the circumstances of his death, it would seem that he was accustomed to place great reliance on the personal loyalty of his followers. A man of genius he certainly was. But of his personality and motives we know virtually nothing. The author of the *Life and Death* concludes that he was " more subtil than Valiant; naturally bold but not cruel, shedding no mans Blood out of wantonness or delight, but in his own defence, or by the Chance of a shot; he was rapacious; but not covetous; he gather'd much money to save himself, and to inrich others; like a Bird of Prey he was greedy to devour, but all went through him as fast as he swallowed . . . . Necessity first prompted him to evil courses, and success hardened him in them . . . . Temperance, Liberality, and Reservedness were the three qualityes that preserved him . . . ." To this may be added Brewster's admission that he was "a scholar and a man of parts," and that he was comparable to Scanderbeg, the fifteenth-century leader of Albanian mountaineers in a war of independence against the Turks. This is to my knowledge the sole contemporary indication that O'Hanlon's life of revolt may have been the outcome of something more than an inherent propensity to crime. Whatever his motives—and it may well be that they were a mystery to the author of the *Life and Death*—he associated himself with a tradition deriving from popular resistance to the expropriation of the native Irish by the English. His career may be regarded as a notable episode in a long guerilla struggle whose root cause was agrarian.

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(1) H.M.C., *Ormonde MSS.*, N.S., vi. 55-6.

(2) Ibid., p. 58.

(3) Ibid., pp 66, 71-2.

(4) Prendergast, *Ireland, 1660-1690*, p 122.

(5) Newspaper Department, Colindale.

4. The Redmond O'Hanlon of legend.

The growth of an O'Hanlon legend is a subject on which a whole volume could be written. Here I can offer only a rough and tentative sketch. In the eighteenth century we find Redmond given pride of place in a kind of rogues' chronicle entitled *A Genuine History of the Lives and Actions of the most notorious Irish Highwaymen, Tories and Rapparees, from Redmond O'Hanlon, the famous Gentleman-robber, to Cahier na Gappul*, by J[ohn] Cosgrave. The earliest edition of this work known to me, in the National Library, Dublin, is the ninth, and was printed at Belfast in 1776. At least eight other different editions and re-issues of the book can be traced, the latest conjecturally dated 1850, and printed at Dublin.(1) It is a small pocket-volume, intended for popular consumption, and it must have had an extensive circulation. The part dealing with O'Hanlon was more than once printed separately as a penny chap-book.(2) The great Dr. Henry Cooke informed a royal commission in 1825 that these were among his school books.(3) Cosgrave is the source of many picturesque details and anecdotes about Redmond, some of them drawn from the *Life and Death*, but many, it would seem, based only on popular tradition. It is in Cosgrave that Redmond first appears as the protector and benefactor of poor men and the enemy only of the rich. Cosgrave was a story-teller, and his history is shaky. He dates a document alleged to have been written by Redmond as 1695, and he tells us that Redmond's most dangerous foes were the Johnstons of the Fews, who only settled in county Armagh in the early eighteenth century.(4) But the Johnstons were great tory-hunters in Cosgrave's own time, and he therefore supposes that they had been so in Redmond's.

In the nineteenth century, this material was worked over by writers who took their task more seriously than Cosgrave but produced worse history than he. William Carleton(5) in the very inferior novel *Redmond Count O'Hanlon*, first published in 1862, lays his scene in 1696, though he seems to think that this date falls within the reign of Charles II. In Carleton, we have the beginning of a sentimentalised version of Redmond, which, developed by Thomas Clarke Luby, the fenian, in his *Illustrious and Representative Irishmen* (New York, 1877),(5) attained its fullest expression in a series of articles contributed to the *Dublin Penny Journal* by Henry M. J. O'Hanlon, in 1904.(1) Here, in a comprehensive mixture of fact and legend, Redmond is portrayed as a kind of knight-errant, who imposes a strict moral code on his followers. Here also we learn such specific details of his life as that he fought in the Irish armies against the English in 1641-1652, fled to France in 1653, distinguished himself in the French army, and was made a count of French empire, though there was then no French empire and though there is no authority for any of these statements save that of Carleton, Luby, and the poet, P. J. McCall.(2) Redmond was certainly called " Count Hanlon " in his own day, but the only contemporary explanation of the title is a statement in the *Life and Death*, and another in Sir Francis Brewster's letter on his killing, to the effect that, when Redmond's reputation had spread, he was described as " count " in French newspapers. This is intelligible enough, but it does not mean that Redmond was in fact a French count or that he was ever in France. In county Armagh to this day, as I am told by Mr. T. G. F. Paterson of Armagh Museum, " count " is still sometimes used as a nickname for persons uncommonly fond of neatness in their dress.

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(1) Four (?1828-1843) in the National Library, Dublin; one (?1843) in the King's Inns Library, Dublin; three (1839-?1850) in the British Museum. I am indebted for the first two references to Dr. R. Dudley Edwards, of Dublin.

(2) Copy in British Museum, printed in Glasgow, 1840.

(3) *First Report of the Commissioners of Irish Education Inquiry* (30 May 1825), p. 43.

(4) *Louth Archaeological Journal* (1934), viii. 128-9.

(5) Luby's O'Hanlon is reprinted as an appendix to a new edition of Carleton's book, Dublin, 1886.

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(1) " Clanna O'Hanluain." Reprinted in *Portadown Times*, Dec. 1933—July 1934.

(2) *Songs of Erinn* (1899), pp. 24-5.

10th March, 1936.

DR. R. H. HUNTER, M.R.I.A., President, in the Chair.

PROFESSOR DOUGLAS C. HARRISON, D.Sc., Ph.D.

VITAMINS.

I feel I might have chosen a more dramatic title for this lecture. A short time ago, your President delivered a lecture entitled " The Glands of Destiny." Our destiny is no less determined by the vitamins which we eat or omit from our food, and indeed, I hope to show that the vitamins bear in many ways a very close relationship to the hormones or " chemical messengers " produced by our ductless glands. It would be useless for me to attempt to give a complete account of the vitamins in a single lecture. I shall try to deal not so much therefore with the history of the vitamins as with the present day position of the subject and with some of the problems which remain to be solved.

Many of you will be familiar with the general history of the discovery of vitamins—how chance observations and early experiments gradually led to the recognition that other substances besides protein, fat, carbohydrate and salts are necessary to form a complete diet. The discovery of vitamins may be attributed to the change of habits due to civilization. So long as people consumed a natural, fresh, mixed diet, there was little chance of their becoming deficient in any essential food factors. When, however, as in the case of the early explorers, they consumed a limited or preserved diet, or when, for commercial reasons, the food began to be specially treated, as in the case of the substitution of polished rice for the natural rice in certain districts of the East, then obvious symptoms of disease began to appear. You will have heard of the terrible prevalence of scurvy among the crews of the ships of the early explorers and how well-known seafaring men such as Admiral Hawkins and later Captain Cook found that they could cure or prevent this disease by providing their men with fresh fruit. You may have heard, too, of the famous observations of Eijkman, a prison doctor in the Dutch Indies in the late nineteenth century. Eijkman was faced with a serious outbreak of beri-beri among the native prisoners under his care. Beri-beri is a serious disease characterised by muscular weakness and nervous changes which we now know to be due to lack of vitamin B_1. Eijkman noticed that the hens kept at the prison, which were receiving a similar diet, developed symptoms resembling beri-beri. This suggested to him that the disease might have a dietetic origin. By dietary experiments on the hens, he was able to show that the disease was due to the fact that polished rice had recently been substituted for unpolished rice in the prison diet. Addition of the rice polishings was found to cure beri-beri, both in the hens and in the prisoners. These observations were of the utmost importance, not only as providing a cure for the disease, but also pointing a way to the use of animals in the study of dietary deficiencies. They were at first given the wrong interpretation, however. As with the curative effect of fresh fruit on scurvy, the rice polishings were believed to counteract beri-beri by antagonising some positive factor in the disease, just as we may take a bottle of medicine or receive an injection to counteract some harmful factor associated with a particular disease. The fundamental fact that disease might be caused not only by the presence of a positive harmful factor but also by the absence of some essential factor had not yet been realised. Then came the classical experiments of Hopkins at Cambridge in about 1906. He showed that animals such as rats which were fed on a carefully purified diet of proteins, fats, carbohydrates and salts failed to grow, began to lose weight and soon died. The addition to this diet of a small amount of a natural foodstuff such as milk, however, enabled the animals to grow and flourish. Hopkins found that the fat of the milk was equally effective, as was also the unsaponifiable portion of the fat. This indicated strikingly the importance of very small quantities of unknown factors in the diet. Hopkins suggested that these should be called accessory food factors and put forward the view that owing to their activity in very small amounts, they played the part of catalysts, influencing chemical reactions in the body but not supplying energy or building up tissues. This appears to be the first clear recognition of disease due, so to speak, to a negative factor, to the lack of something essential in the diet. It was gradually realised, too, that the earlier observations on diseases such as scurvy and beri-beri could be interpreted in a similar way. About this time Funk had attempted to purify the factor in rice polishings which cured beri-beri, and had obtained crystalline fractions containing organic bases or amines. He thought that the accessory food factors were organic bases and suggested the name " vitamine." We now know that some of the factors do not even contain nitrogen—they are not amines. The name had become well established, however, so to avoid the anomaly, it was shortened to " vitamin " without the final e.

Let us consider, now, how far the subject has advanced since the time, only about twelve years ago, when the vitamins were regarded as somewhat mysterious organic substances of unknown constitution. About ten different vitamins have now been described. We know the actual chemical structure of five of them and three have been actually synthesised. They have been divided for convenience into two main groups, the fat-soluble and the water-soluble vitamins.

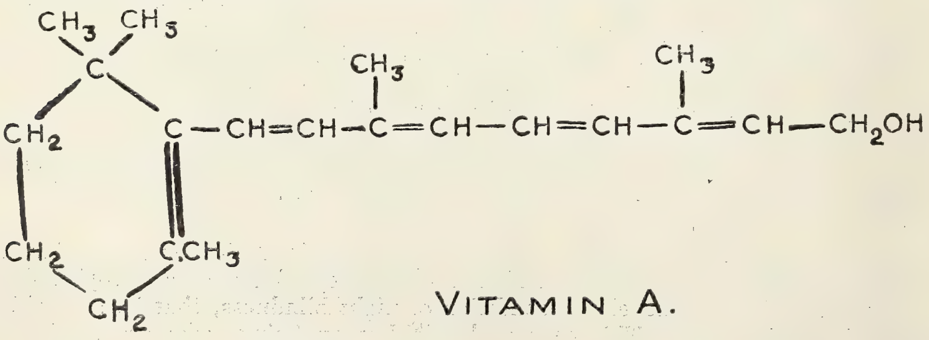
Vitamin A is the first of the fat-soluble vitamins. Young animals such as rats when fed on a vitamin A-deficient diet soon cease to grow, begin to lose weight and die. If vitamin A is added to the diet in time, the animals start to grow normally, in fact, vitamin A is often called the growth-promoting vitamin. This name is unsatisfactory, for all the vitamins are necessary for normal growth and development. In the absence of any one of them, growth may be retarded and hence all or nearly all of them might be called growth-promoting. This power of inducing normal growth when a vitamin is added to a diet otherwise complete, i.e., containing all the other vitamins, is ordinarily used in testing for many of the vitamins.

One of the most obvious symptoms of vitamin A-deficiency is that the animals develop an infective condition of the eye known as xerophthalmia. Previous to this, they develop a condition of night blindness, that is, an inability to see in a dim light. This occurs also in human beings who are receiving a diet deficient in vitamin A.

There has been much discussion of late as to whether vitamin A protects against infection. There is no doubt that animals suffering from vitamin A deficiency become attacked by infections in different parts of the body and probably failure to grow and death may be secondary to these infections. The presence of vitamin A appears to be necessary for maintaining intact certain tissues which line the alimentary canal. When these break down as in A-deficiency, bacteria are enabled to invade the animal. A similar liability to infection appears to occur in human A-deficiency. Whether people who are receiving normal amounts of the vitamin can increase their resistance to infection by taking extra amounts of vitamin A is another matter and this cannot be regarded as definitely settled.

In parenthesis, I might just remark that no doubt many of you very naturally feel a distaste for the idea of using animals for these tests. I can only say that the animals are merely fed on incomplete diets such as those unfortunately only too often employed through ignorance or necessity in bringing up children, and that the animals and the children suffer similar consequences. Further, as a result of these experiments, we have learnt so much, that formerly incurable diseases such as rickets are now completely preventible. I am uncertain, unfortunately, how far this claim of putting the health of human beings above the comfort of a few animals is generally accepted. I saw, as probably many of you did, that a recent wireless appeal produced forty-nine pounds for a mothers' and babies' welfare centre in London, while for a dispensary for animals of the poor, a sum of no less than eighteen thousand pounds was sent in. In any case, while it is still necessary to use animals in testing for vitamins, the time will come when the vitamins are all identified and isolated as pure chemical substances. Chemical tests are being and will be found for them and the animal experiments will no doubt be superseded. Meanwhile, I might just mention that recent work has shown that certain insects such as Drosophila—the banana fly—need certain of the vitamins, and it seems just possible that some of the vitamin tests might be carried out using a rapidly developing insect such as this instead of rats and guinea-pigs.

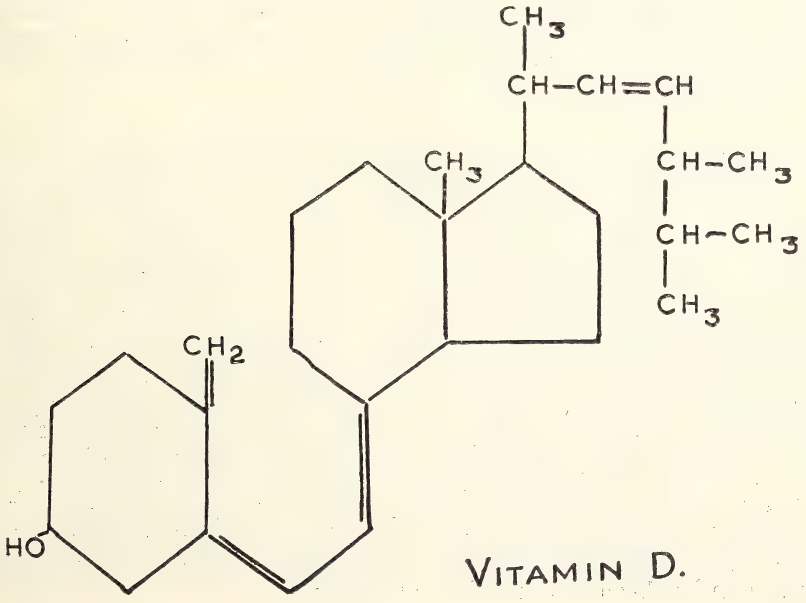
Now in estimating the amount of vitamin A in vegetables, it was noticed long ago that, generally speaking, the yellow coloured vegetables were richer in this vitamin than the less pigmented varieties. This observation led to the discovery that one of the chief yellow plant pigments, carotene, is converted almost quantitatively into vitamin A in the body. So it does one just as much good to eat substances containing carotene as to eat substances containing vitamin A. The chemical structure of vitamin A has been shown to be as follows:—



VITAMIN A.

Vitamin A has not yet been synthesised, but a derivative (the fully hydrogenated compound) has been synthesised and turns out to be identical with the substance obtained by hydrogenation of the natural vitamin A. Vitamin A is found chiefly in liver oils, butter, milk, egg yolk and, as carotene, in plants such as carrots, tomatoes and green vegetables. It is not readily destroyed by cooking.

Another of the fat-soluble vitamins is vitamin D, the calcifying or antirachitic vitamin. This vitamin is necessary for building up bones and teeth. The story of the discovery of this vitamin is interesting. Feeding experiments by E. Mellanby had indicated that rickets was caused by lack of certain substances particularly animal fats in the diet, and could be cured by such substances as butter and cod liver oil. At first, he thought the effect might be due to the already known vitamin A since the distribution of the factor in foods seemed similar to that of vitamin A, but it was soon shown that vitamin A could be destroyed in foods leaving the rickets-curing factor. The latter was thus evidently distinct from vitamin A and was called vitamin D. About the same time an investigation was being carried out in Glasgow by other workers in which the dietaries and home conditions of rachitic and non-rachitic children in the slums were compared. The diets of the two groups of children appeared to be very similar, but it was found that the children who were free from rickets, generally speaking lived under less crowded conditions and had more opportunity for exercise in the open air. The view was put forward therefore that rickets was not a deficiency disease but primarily a disease due to lack of exercise. Then came the remarkable discovery that rickets could be cured by exposing the skin to ultra-violet radiations, either artificial radiations from a mercury vapour lamp or natural rays from sunlight. It was found, too, that many foodstuffs could be made curative towards rickets by exposure to ultra-violet rays. The beneficial effect ascribed to exercise in the open air then received explanation, being in reality due to the exposure of the skin to ultra-violet light and not to the effect of exercise itself. It was later found that there is present in many natural foods and in the skin a substance which on exposure to ultra-violet light of certain wavelengths is converted into vitamin D. This parent substance was first thought to be cholesterol, but it was later found to be another sterol—ergosterol. By irradiation this is converted into a substance, calciferol, which is made up of the same atoms slightly differently arranged. This is pure vitamin D, and probably has the following structure:—



VITAMIN D.

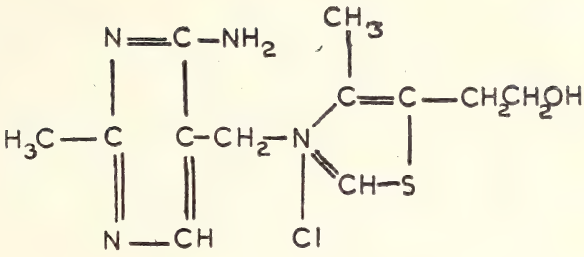
Vitamin D is the only vitamin which has been found to be harmful if taken in excessive amounts. Doses of the vitamin several thousand times greater than the normal amount can produce very harmful calcification of the arteries and various organs of the body. Such excessive doses were unlikely to be taken when cod liver oil was used as a source of vitamin D, but when the various artificial preparations appeared on the market, there was a danger of excess, for the daily requirement of vitamin D is only about 1/5000 mgm. per head. This danger of hypervitaminosis was one of the reasons which led to the setting up of a League of Nations committee which formulated definite standards or units of measurement for all the vitamins. As the vitamins one by one become isolated, these arbitrary standards are being gradually replaced by standards involving definite weights of the pure vitamins.

It was found by Mellanby that diets which tended to produce rickets were made much more rickets-producing by the addition of cereals, especially oatmeal. This has been fiercely disputed, especially by the Scotsman, who points out what a fine race has been produced on a diet containing much porridge. The explanation may be that the Scotsman takes milk and cream containing vitamin D with his porridge and that his diet otherwise contains plenty of vitamin D. It has been facetiously suggested that the wearing of kilts is protective owing to the exposure of the knees to sunlight. Whatever the explanation, there appears no doubt that a bad diet, partially deficient in vitamin D, is made worse by the presence of much cereal. The reason for this antirachitic action of cereals is not at present clear, but a possible explanation seems to be that these cereals contain much of a compound called phytin, which is rich in phosphorus. This forms a very insoluble calcium salt and possibly thus interferes with the absorption of the calcium of the food in the alimentary tract so that less calcium is available for building of bones and teeth.

I have spent a considerable amount of time on vitamin D because a deficiency of this vitamin is more likely to occur in this part of the world than any other deficiency. The richest natural sources of the vitamin are dairy products and liver oils, especially cod liver oil. The amount in milk is variable depending on the season of the year. It is said that it can be increased in the winter by feeding cod liver oil to the cows.

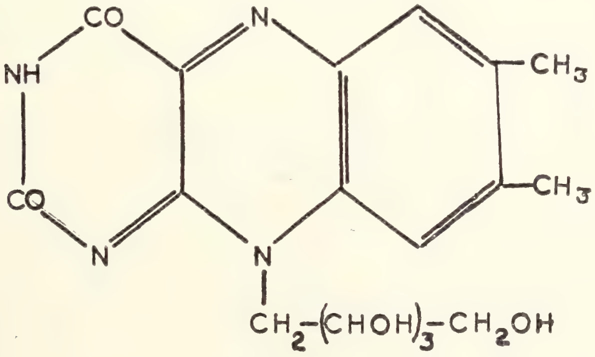
The last of the fat-soluble vitamins is vitamin E or the antisterility vitamin. This vitamin has been shown to be necessary for normal reproduction in the rat, and is essential both in the male and female. Whether it is nececsary for human reproduction is unknown. In any case, its wide distribution in foods makes a deficiency unlikely to occur, though, in the form of wheat germ oil, it has been administered in cases of persistent miscarriage and some success has been claimed.

We now come to the so-called water-soluble vitamins, B and C. Vitamin B, originally thought to consist of one vitamin, has gradually been resolved into a number of constituents, until now at least six vitamins B have been described. Vitamin B_1, the anti-neuritic or anti-beriberi vitamin, is necessary for protection against beri-beri, a disease which occurs in the East among rice-eating peoples when they consume rice which has been too thoroughly milled or polished. Pigeons are usually employed in testing for this vitamin since they are very susceptible to its deficiency and rapidly recover on its administration. Vitamin B_1 has been obtained crystalline and its chemical constitution will probably soon be known. (Since this lecture was given, vitamin B^1 has been synthesised and its constitution has been shown to be as follows:—



VITAMIN B.

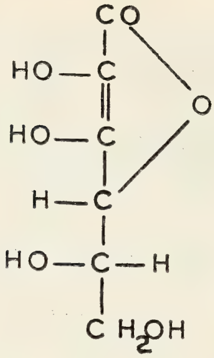
Vitamin B_2, sometimes called the anti-pellagra or anti-dermatitis vitamin, appears itself to consist of at least two components, one of which, lactoflavin, has recently been synthesised and has the following structure:—



LACTOFLAVIN

The other vitamins of the B complex are less well differentiated. They are all found in yeast, cereals and vegetables, and it is usually considered that Europeans are unlikely to incur a deficiency of these vitamins.

Vitamin C, the antiscorbutic or anti-scurvy vitamin, has a peculiarly interesting history since it was isolated as a pure crystalline substance in 1928, but four years elapsed before it was realised that this substance was actually the vitamin. Szent-Györgyi, working at Cambridge, isolated from the suprarenal gland and from oranges a crystalline substance with powerful reducing properties. Four years later, Tillmans, a public analyst in Germany, pointed out the similarity between the reducing properties of fresh fruit and vegetables which contained vitamin C, and the reducing activity of the crystalline substance isolated by Szent-Györgyi. Szent-Györgyi then carried out biological tests on the latter and it turned out to be none other than the pure vitamin C. The structure of this substance, which was renamed ascorbic acid, is fairly simple, being related to the simple sugars:—



VITAMIN C.

Vitamin C can now be easily synthesised and the synthetic vitamin can be made more cheaply than it can be obtained in natural fruit such as orange juice. This synthesis is of more than academic interest since it solves what was formerly a serious problem with Polar explorers, namely, of providing sufficient vitamin C in the diet to protect them from scurvy. Instead of having to transport quantities of bulky and heavy fruit, they can now take a small quantity of a stable crystalline substance—the pure vitamin.

It is remarkable that vitamin C is required only in the food of guinea-pigs, monkeys and man. Other animals need the vitamin, but they are able to build it up in their own bodies, possibly in the suprarenal gland. This brings me to the point I mentioned at the beginning of my lecture, namely, the close relationship between the vitamins and the hormones. In animals, other than guinea-pigs, monkeys and man, ascorbic acid is produced by some gland in the body and carried round in small quantities in the blood to bring about essential activities in different parts of the body; in other words, it is a typical hormone. Thus, ascorbic acid is a hormone in some animals and a vitamin in others.

I might just mention in passing that rats can acquire an immunity to lack of another vitamin, namely, vitamin B. This sometimes occurs spontaneously during vitamin tests and is due to the growth of certain bacteria or yeasts in the alimentary canal of the animals. These organisms synthesise enough vitamin B complex to enable the rats to thrive without getting any in their food. Other rats, if put with these immune animals, can catch the immunity from them.

While most of the tests for vitamin C have, in the past, been carried out on guinea-pigs, this use of animals is now becoming unnecessary since we know the exact chemical composition of this vitamin, and owing to its reducing power, it can be titrated chemically using a suitable reducible dyestuff.

Now that so much has been, and is being, discovered regarding the chemical nature of the vitamins, what problems remain to be solved? One problem on which information is needed is the question of the amounts of the different factors which are optimal, the amounts which will not merely prevent disease, but which will produce the best possible state of health in man. Secondly, we want to know how the different vitamins bring about their characteristic actions. The mode of action of vitamin B_1 is already partially known. Peters and his co-workers at Oxford have shown that this vitamin is necessary for oxidation by the brain of lactic acid (or more strictly, the pyruvic acid into which lactic acid is converted). The oxidation of lactic acid, which is formed largely from the carbohydrates in the food, is one of the most important oxidation processes in the body, and in vitamin B_1 deficiency the reaction is retarded. Peters found that if the brain were taken after death from pigeons suffering from vitamin B_1 deficiency, its ability to oxidise pyruvic acid could be restored by the addition of minute amounts of the pure vitamin. This was the first demonstration of the action of a vitamin on a tissue after removal from the body. In the case of another vitamin, vitamin C, I found that its activity could be demonstrated *in vitro*. Tissues taken from a guinea-pig suffering from scurvy showed a lower uptake of oxygen than normal, and the oxygen uptake could be restored by addition of small amounts of the pure vitamin.

Lastly, may I just indicate to you in a word what modern researches on vitamins indicate that we should do in order to obtain a correct diet for normal health. The main thing is that we should vary our diet so that whatever vitamin may be lacking in one food we may get in another. We should try to take green vegetables and fruit, plenty of dairy products—milk, eggs, butter, cheese—and a certain amount of liver and of fish, particularly fatty fish such as herring. If these rules be followed, there is little need for us to be constantly worrying about whether we are eating a properly balanced diet.

ANNUAL MEETING.

115th SESSION.

The Annual Meeting of the Society was held in the Society's Buildings, College Square North, on Friday, 30th October, 1936, to consider the Council's report for the 115th Session and the Hon. Treasurer's Statement of Accounts and to transact such other business as may be brought before an annual meeting.

The chair was occupied by the President, Dr. R. H. Hunter, M.R.I.A., and among those present were Colonel Berry, M.R.I.A., Mr. W. B. Burrowes, F.R.S.A.I. (Hon. Treasurer), Rt. Hon. Saml. Cunningham, Mr. Alex. Davison, F.R.S.A.I., Mr. Godfrey Ferguson, F.R.I.B.A., Miss Gaffikin, Mr. F. Adens Heron, D.L., Captain Blakiston Houston, Mr. R. S. Lepper, M.A., Mr. A. G. Pomeroy, M.A., Mr. Joseph Skillen, Captain Turner, M.C., and A. Deane (Hon. Secretary).

Apologies for inability to attend the meeting were received from Messrs. F. J. Cole, W. M. Crawford, B.A. (Hon. Librarian), E. J. Elliott, R. A. Mitchell, LL.B., and Professor Morton.

REPORT, 1935-36.

Your Council has pleasure in presenting the report for the 115th Session of the Society.

While the Council cannot lay claim to any outstanding activities during the year, much useful work has been accomplished.

OBITUARY.

It regrets to record the death of a former President of the Society, Mr. J. H. Greenhill, Mus.Bac., who was President for the years 1889-91, and of Mr. Robert J. Welch, M.Sc., M.R.I.A., an Hon. Member, who died as recently as the 28th September last and whose life-long devotion to Natural Science and Prehistoric Antiquities has spread an interest in these subjects far and wide over Ulster. See Obituary Notice, page 45.)

MEETINGS.

Seven general meetings were held during the year and at these many interesting subjects were dealt with. On the whole the meetings were better attended than in recent years and members were inclined to express their views and take part in discussions more freely. With the exception of Professor Macalister, who is a well known Professor at the National University, Dublin, all the lecturers, including our President, were members of the teaching staff of Queen's University. This fact alone rendered the session of more than ordinary interest. A good programme has been arranged for the coming session.

ARCHAEOLOGICAL SECTION.

At the Archaeological Section meetings five papers were read during the past winter. Its activities however have been mainly devoted to field work, which is its chief object. The excavations carried out by it conjointly with the Belfast Municipal Museum at Dun Ruadh in Co. Tyrone have been brought to a successful conclusion, and a start has been made towards the repair of Corick Abbey in Co. Tyrone. The members of the Section, the Council is glad to report, are taking greater interest in excavation; in the past many found it difficult to go into the country to watch or assist in excavations, but several new recruits have been obtained this year, and the Section hopes to have a considerable body of experienced excavators within a few years.

REPRESENTATIONS ON COMMITTEES.

Mr. W. M. Crawford, the Rt. Hon. Saml. Cunningham and Dr. Hunter were appointed, during the year, to represent your Society upon a Committee which has been set up by the Ministry of Finance to deal with any possible operations in Northern Ireland of the National Trust for places of Historic Interest or Natural Beauty. Mr. E. E. Evans, M.A., F.S.A., continues to represent your Society on the Ancient Monuments Advisory Committee of Northern Ireland, while Mr. E. J. Elliott is your representative on the Libraries, Museums and Art Committee of the Belfast Corporation.

EXCHANGE OF PUBLICATIONS.

Your Hon. Librarian (Mr. W. M. Crawford) reports that the Exchange list shows four interesting additions, viz., the publications in Biological Science of the University of California at Los Angeles, the State University of Odessa, Russia (Biology), " Collections Historical and Archaeological " of the Powysland Club, Welshpool, Montgomeryshire, and lastly the Reports of the National Trust.

The work of completing sets of Proceedings in the Belfast Museum Library, where the greater part of the Society's library is now deposited, continues to make progress and it can be said with confidence that an increased use is being made of the Museum Reference Library.

PROCEEDINGS.

Your Council has decided to increase the size of the format of the Society's Proceedings from its present size (demy octavo) to imperial octavo, in order to bring it into line with many of the leading scientific publications in England.

This will give an opportunity for larger line-blocks to be inserted in the text and enable more illustrations to be included in the plates. The altered size will start a new series of the Proceedings, the session just closing being part of Vol. I.

THE BUILDING.

The Society's Agents, Messrs. Davison & Dickey, report that all the available accommodation is occupied by suitable and satisfied tenants. The nightly lettings were better during last winter than in the previous year, but there are still many unoccupied evenings. Members should let it be known that the lecture hall and small room are available for daily and nightly lettings. The new chairs which have been placed in the lecture hall have added to the comfort of those attending meetings and have been much appreciated. Your Council will have to consider the question of painting the exterior of the building during the coming session.

SHAREHOLDERS AND MEMBERS.

Three shares (no. 321) registered in the name of the late Major Charles Blakiston Houston have been transferred to his nephew, Captain J. M. Blakiston Houston. The number of shareholders and members at present is 203 as compared with 210 in the previous session. There are a few outstanding subscriptions which your Hon. Treasurer hopes to collect during the next few weeks.

Mr. Burrowes will bring before this meeting the Statement of receipts and expenditure and, if passed, it will be placed before the Local Government Board Auditor for certification, and printed in the Society's Proceedings.

COUNCIL MEMBERS.

In order to comply with the Society's constitution five members retire from the Council in rotation, after serving for three years. The names are as follows:—Professor T. Thomson Flynn, Mr. F. Adens Heron, Dr. Hunter, Mr. R. S. Lepper and Professor Morton. All these members have served on the Council for several years and are eligible and willing to stand for re-election.

HON. TREASURER'S STATEMENT.

The financial statement was presented by Mr. W. Bel Burrowes, the Hon. Treasurer, who stated that they had started the year with a debit balance of £145 18s 6d and closed their accounts with a debit balance of £95 7s 1d. He thought that to wipe £50 off their debt in twelve months was very satisfactory.

ADOPTION OF REPORTS.

The President, in moving the adoption of the reports, referred to the death of one of their most enthusiastic members, Mr. R. J. Welch. The motion was seconded by Mr. A. H. Davison and the reports were adopted.

ELECTION TO COUNCIL.

On the motion of Mr. Joseph Skillen, seconded by Captain E. J. L. Turner, M.C., the following were re-elected on the Council:—Professor T. Thomson Flynn, Mr. F. Adens Heron, Dr. R. H. Hunter, Mr. R. S. Lepper and Professor W. B. Morton.

THANKS TO PRESIDENT.

On the motion of Mr. A. G. Pomeroy, M.A., thanks were accorded the President for his work on behalf of the Society during the past two years. The report, Mr. Pomeroy said, recorded increased attendances at the meetings and he thought this was largely due to the President's services.

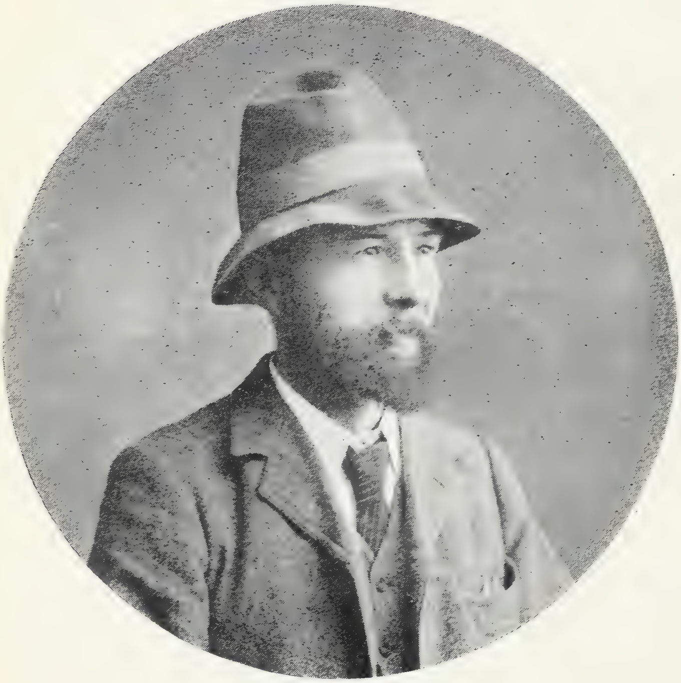
Mr. Pomeroy referred to the absence of younger men, and said he thought an effort should be made to get them to come forward and take more interest in the good work of the Society.

Dr. Hunter, replying, thanked Mr. Pomeroy and those present and said it was to be regretted that they were not getting junior members into the Society. If they did not get younger people to replace those who were passing from them, the outlook for the future was not a very happy one. He thought with a little bit of energy on the part of the Seniors the younger people might be induced to join the Society.

At the conclusion of the meeting the new Council met, when Mr. R. S. Lepper, M.A., LL.M., was unanimously elected President for the coming year; the Vice-Presidents, the Hon. Treasurer, the Hon. Librarian and the Hon. Secretary were re-elected.

BRITISH MUSEUM

[B.N.H.P.S. Proceedings, 1935-36.]



Robert J. Welch, M.Sc., M.R.I.A.
Died 1936.

OBITUARY.

ROBERT JOHN WELCH.

I first met Robert John Welch more than thirty years ago, having just left England and many things were new and strange then. I remember thinking how vital this Ireland must be if we were to know such men as he . . . . but in all the years we never met another like him; he was unique in his generation. At the time I was distinctly complimented by his easy and instant friendship, as if he had known us for years, but I soon found out it was just his little way.

It was a soft April evening and " R.J." wore a mackintosh (which was his constant uniform for all the aforesaid thirty years), and a soft hat (this had a daring aspect, for such things were not worn then). It was about this time that he sent us a photograph of himself with a revised version of a hymn by Dr. Watts on the back. The lines went (referring to the said hat):—

" It never fades, it ne'er grows old,
Nor fears the rain, nor moth nor mould,
Sarcasm ignores and still refines,
The more 'tis worn, the more it shines.
In this on earth I will appear,
Then go to heaven and wear it there;
Let me be dressed fine as I will,
Snails, Flies and Worms exceed me still."

" R.J." had a rarely gay and uplifting laugh and was as full of fun as a boy and the yarns he could tell of sundry larks of himself and his friends. He seemed to know intimately every corner of the country and every person in it whose interests touched his own. Such was his economy of mind that he was never known to waste time on mere trivialities of conventional greeting but invariably plunged straight into whatever of importance burgeoned in his mind as he met anyone. He lacked the restraints which with so many of us so often smother spontaneous thought and friendship.

" R.J." had been but a lad of sixteen when his father died, leaving him with a photographic business to carry on and the added responsibility of caring for his mother and little brothers and sisters, all of which he did nobly. Of course his father had drilled him pretty well and had given him the right sort of interests early. Incidentally he adored his mother and was for ever talking of her in those first years of our acquaintance and the pride in his voice as he referred to her was illuminating: it had a sort of music with it that was worth waiting for. " R.J." had joined the Belfast Field Club when both he and the Club were young; he had known and worked with most of the Field Club's foundation members, and there were some giants in those days. He had taken part in those early excursions when Ulster's book of nature lore had many unwritten pages and the members achieved strenuous and often original work. He once showed me an amazing diary, evidently kept with meticulous care, having copious notes on the activities and work accomplished on every excursion he had taken part in and also notes of wandering on his own. His scrupulous care in noting instantly and exactly was the foundation of his inexhaustible well of stories and his fully indexed mind. No wonder he had so much to tell, or was so sure of his facts when he discoursed.

" R.J." was mainly instrumental in founding the Junior Branch of the Field Club. " A Feeder " he called it, for none knew better than he that enthusiasms need to be planted young in most of us if they are to contend with mental laziness and so many ready-made amusements which it is so easy to drift into these days. No one was more energetic in aiding and abetting the success of the Juniors than he, no one more absorbed in the young folk, in their progress, their industry, their increasing interests, none was more keen to share anything he knew with them.

The death of his mother about 1908 was a deep and abiding sorrow to him and few mothers have had so devoted a son. Then for twenty years or so his sister went on keeping house for him and watching over him and his needs . . . . then she died too. He had always seemed to us as light-hearted as a lad, but with this last blow even his gay courage failed him. He wrote me at that time that " it seemed as if half his life had been torn away." He was like a ship adrift on a heaving sea in his bewilderment and one realised then that his wide interests, his great activities, his restless energies had been possible only because of his safe anchorage in hearts that loved him.

After this his friends often became anxious about him. He had helped so many in his time, but now, stricken so sorely himself, he put friendship beyond the pale and no one could reach him even though they ached to help him. He seemed to be quite lost for two years or so before he bobbed up again and resumed his old activities and took up life anew, outwardly, at least, the old " R.J."

" R.J." was a staunch friend and very loyal and was never known to have an unkind thought about anyone. It was illuminating how he managed to turn a blind eye on any faults of a friend and somehow to magnify their virtues. How he could brag of a friend's achievements! He was an easy friend with everyone and it was his constant boast in those early years that he had dined at the Viceregal Lodge in state and had fed on potatoes and buttermilk in thatched cabins and it was all one to him. He certainly would be the same " R.J." to each host.

For some years in later life " R.J." had the habit of collecting cuttings from newspapers and magazines of all kinds. He was a miniature press-cutting agency. He diligently sorted out his harvest and posted bundles of cuttings to his friends and the friends hardly ever liked it; indeed they so often grew impatient and even protested to " R.J." at the waste of *their* time and even threw them unread into the fire. They would explain all this and implore him to refrain but he went on imperturbably. He once journeyed to Dublin with two men he knew and talked solidly all the way, as was his custom, though as the train left Belfast he produced his bag crammed with cuttings and proceeded to sort them out, putting each bundle into a ready addressed envelope, maintaining all the while a vigorous conversation with his two friends.

But there came a day when some of us sighed a little at the cavalier treatment meted out to those stuffed envelopes with their green stamps. " R.J." was ill and few of us realised how grave it was for he was so valiant, carrying on bravely long after he should have rested, asserting he was as well as ever, and his courage was like a flag. Then quite suddenly he could deny no longer and to the grief and anxiety of his friends he shut himself up and refused to see anyone, till they could only stand aside, hoping against hope that in time he would recover and be his jovial self again. They missed his volubility and his friendship, and if they tried to chat on the telephone, he answered them in monosyllables and again they were put beyond the pale. The said friends talked and talked and made great plans for his comfort and his future but no one could ever find out how to put those plans into action. For a whole year this went on till suddenly and quietly " R.J." slipped out of life, slipped beyond the reach of all his friends, but he left imperishable memories with all who knew him as the " very parfit, gentil knight " he was.

GRACE DEANE.

See also Obituary Notices:

The Irish Naturalists' Journal, November, 1936.
Belfast Museum Quarterly Notes, June, 1937.

ARCHAEOLOGICAL SECTION.

ANNUAL MEETING.

The Annual Meeting was held in the Society's Buildings on the 5th November, 1936, Mr. Oliver Davies, Chairman of the Section, in the chair.

Before calling upon the Hon. Secretary of the Section to read the Committee's Annual Report the Chairman referred in feeling terms to the death of Robert J. Welch which took place on the 28th September last.

The Hon. Secretary read the Annual Report for the year ending 31st October, 1936, as follows:—

ANNUAL REPORT.

Your Committee is glad to be able to report that the summer has been a season of intense archaeological activity in Ulster, in which the Section has had a considerable share. They are particularly pleased that several new excavators have taken the field, and therefore hope that the principal difficulty in the past, the lack of trained supervisors, will soon be remedied, so that Ulster will no longer need to call in outsiders to direct its archaeology.

The excavations at Dun Ruadh (Tyrone) were completed by your Chairman, Mr. Oliver Davies, in May. Four more cists were discovered, making a total of ten, and the plan of the monument was completed; a good deal of neolithic and bronze age pottery was found. In addition, two small cairns just outside the monument were tested; it was proved that they had been the sites of large fires in the prehistoric period, and perhaps the bodies were there cremated before being deposited in the cists.

The excavations at the fort of Sallagh Braes (Co. Antrim) were completed by Miss Gaffikin and Mr. Davies. The side of the souterrain was examined, and more information was obtained about the various layers in the fort.

A start has been made with the restoration of the east window at Corick Abbey (Tyrone), and it is hoped during the winter to make preparations for the re-erection of the arch.

Though unfortunately Prof. Gordon Childe was unable to come to Ulster this year, several other excavations were carried out with the Prehistoric Research fund of the Belfast Municipal Museum, of which reports will be presented to the Section during the coming winter; by Mr. Davies at the chambered cairn of Ballyrenan, by Mr. Evans at Ballyedmond, by Mr. Herring at Largantea, by Messrs. Mullin and Davies at Carrick East. The Committee also notes with interest Mr. May's excavations at one of the caves in Whitepark Bay.

The Committee would like to mention the valuable work being carried out for the Preliminary Survey of Ancient Monuments, to be published by the Government at an early date. Such a survey is extremely valuable with the danger, even to-day, that important monuments may be ruthlessly destroyed. It had already furnished much material for lectures given by Miss Gaffikin and Mr. Evans at the Prehistoric Congress at Oslo, and by Messrs. Evans and Davies at the Society of Antiquaries of London; and at the British Association at Blackpool. One may only add that equal care should be taken to record and publish stray finds.

This is the first year in which the Section has been represented at the Congress of Archaeological Societies, which has enabled it to take its place among the societies of Great Britain.

The Committee regrets that the membership of the Section is not as large as might be hoped, and asks every member to do his best to bring in at least one recruit during the coming year. It may be pointed out that the Archaeological Section is the only Archaeological Society in Ulster that has funds to assist archaeological work, and that though there are other annual contributions for excavation, the Section has a reserve fund which is extremely useful in case of emergency and must not be allowed to disappear or to be squandered. The calls on it are likely to be greater next year than this, so that an increase in membership is very desirable.

The following papers were read during the past year:—" *Emania,*" by Col. R. G. Berry; *The Cladihalliday Cairn*, Mr. O. Davies; *The Dunloy Cairn*, Mr. E. E. Evans; *Greek Education*, by Professor T. A. Sinclair; *The Early Printing Press and how it worked*, Mr. K. Povey.

The report was adopted on the proposal of Miss Gaffikin, seconded by Mr. Thompson.

The Chairman then read the Treasurer's Statement of Accounts, which shewed a slight increase of the balance over the previous year, partly as less work had been undertaken by the Section. It was proposed by Mr. Lepper and seconded by Col. Berry that these accounts be adopted, which was agreed to.

The meeting then proceeded to the election of officers for the ensuing year. As Chairman Mr. Lepper proposed Mr. O. Davies and Mr. Campbell seconded; Mr. Davies thanked the meeting for the honour they bestowed on him in re-electing him. The Hon. Secretary, Mr. E. E. Evans, explained that pressure of work had made it impossible for him to continue in office, which he had taken over in an emergency, and he proposed Mr. I. J. Herring, M.A.; Mr. Lepper seconded. Mr. Lepper proposed and Col. Berry seconded a vote of thanks to Mr. Evans for the work he had done for the Section during the past two years. There were then elected as members of the Committee Col. R. G. Berry, Mr. A. A. Campbell, Dr. D. A. Chart, Messrs. A. H. Davison and E. E. Evans, Miss M. Gaffikin, and Messrs. T. Greeves and J. Skillen, with the President, the Hon. Treasurer and the Hon. Secretary of the Society as ex-officio members.

EXCAVATIONS AT DUN RUADH.

By Oliver Davies.

The cairn of Dun Ruadh (O.S. Doonroe) lies in Td. Crouck in North Tyrone (O.S. sheet 19, plan 16, trace 2), at a height of about 690′ O.D.(1) It is situated on rough and rocky moorland, just above the limits of enclosed country, on the south-west slope of Crockyneill Hill (see map). The neighbourhood is extremely rich in remains. There is a penal altar on the top of the hill, and a few hundred yards east-south-east of Dun Ruadh a strongly built circular wall, probably of an ancient hut. The accompanying map marks the megalithic remains in the immediate vicinity. Within a radius of two or three miles there are many others, such as the circle and tumulus at Aghascribagh, the horned cairn at Carnanransy, the long cairn now nearly destroyed at Broughderg, the single-chambered grave and long cairn at Keerin, two standing stones at Formil, and several small circular cairns.(2)

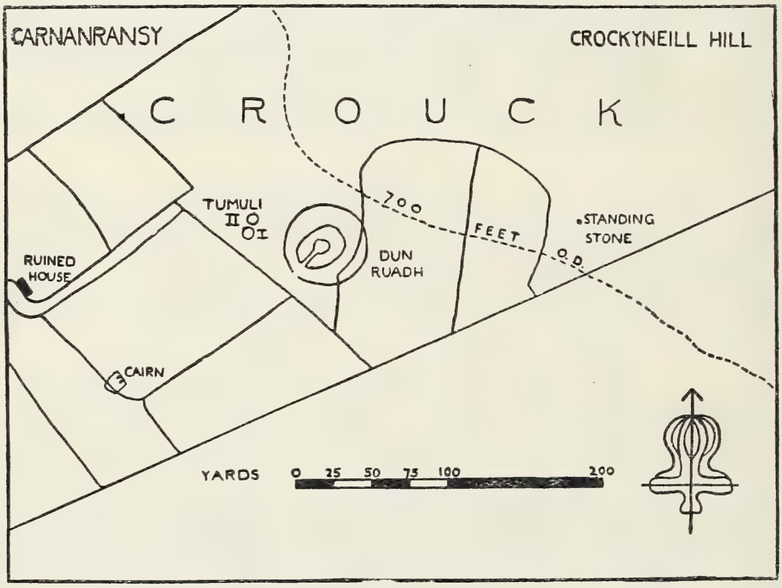


Fig. i.

Dun Ruadh has been sadly wrecked. The turf-layer, which marks the former if not the original height of the cairn at about 7½′ above its base, survives only in one place (section NS); nearly all the cairn-stones except at the bottom appear to have been tossed. It was decided to examine the site carefully before it suffered further damage. Mr. P. M'Aleer, of Greencastle, whose knowledge of the antiquities of the district and of the county is unrivalled, and without whose continued assistance it would have been impossible for the excavation to be carried out, has kindly consented to write an account of the recent history of the cairn:—

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(1) Owing to the distance from a bench-mark, the heights given in General Plan and Sections are taken from an arbitrary point slightly below the monument.

(2) Cp. Preliminary Survey of Ancient Monuments, N.I., publ. Ministry Finance.

"Dun Ruadh (the Royal Fort⁽³⁾), which for many years past has been a place of interest to archaeologists, is very different to-day from what it was half a century ago when I first saw it. Now it is hardly more than a heap of tumbled stones with a discernible trace of a rampart around it; then it was by far the most important Dun in Ireland; in fact, I was informed by the late Prof. Kuno Meyer, of Manchester University, that it was the most important in Europe except one in Bavaria. In 1887, in the company of the late V. J. Kyle, of Gortin, who was a keen archaeologist, I first visited this celebrated Dun. It was then largely as it had existed for thousands of years. I distinctly remember what it looked like. There was an entrance to the interior, round which a passage led; along it a number of cists could be seen, many containing unbroken urns. Two of these complete urns are now in the Dublin Museum. There were in all thirteen cists, as far as I can recollect, some of which were placed in the outside portion of the Dun, but equally well preserved with those around the inside passage. In this year a new National School was being built in the immediate vicinity, in the erection of which the local residents supplied the stones and sand. The school, of which I was Principal for forty years, is a fairly large building; all the stones used in its erection, together with the surrounding boundary walls, were taken from Dun Ruadh. After some time, owing to the large attendance, an additional room became necessary, and unfortunately Dun Ruadh was again called upon to supply the stones. It is not therefore remarkable that the Dun became much altered in appearance, especially as the stones were removed indiscriminately without reference to its existing arrangements. To make matters worse, some four years ago a new bridge was erected at Carnanransy, and a further 500 yards of stones were taken for metal before the matter was brought to the notice of the Ministry, which upon representations about the destruction being done interfered, so that Dun Ruadh is now scheduled as an ancient monument. It is but fair to add that in removing the stones there was no intention of vandalism; it was purely in ignorance of the historic importance of the monument."

It was in 1909, probably at the time of the alterations to Crouck School, that the cists were opened; one would expect that before then they were mostly hidden by cairn. Several food-vessels and flints were discovered in that year, and were shortly afterwards acquired by Dublin Museum⁽⁴⁾; I am indebted to Dr. Mahr for permission to publish these along with the recent finds. Two urns are complete (1909 35 and 36.) It is uncertain to which of these Kyle refers in his letter. The accompanying chips of bones were presumably incinerated; as it is unlikely that they were all removed, his "complete urn" probably came from cist II or IX. There is a fairly strong tradition that one unbroken pot was found in cist I. There are three other pots in Dublin⁽⁵⁾; of these, a fragment of 1909 38 was still lying in cist III, one of the others may be from VII. Two broken pots were found by us, one in cist VIII, and 104, which was clearly thrown aside under the ringstone where we discovered it; it is therefore likely to have come from one of the central cists, possibly X. The pot in cist IV we found complete.

According to Kyle's account, the cists were floored with loose slabs, like IV which we found intact. The grey powder which he reports may have been

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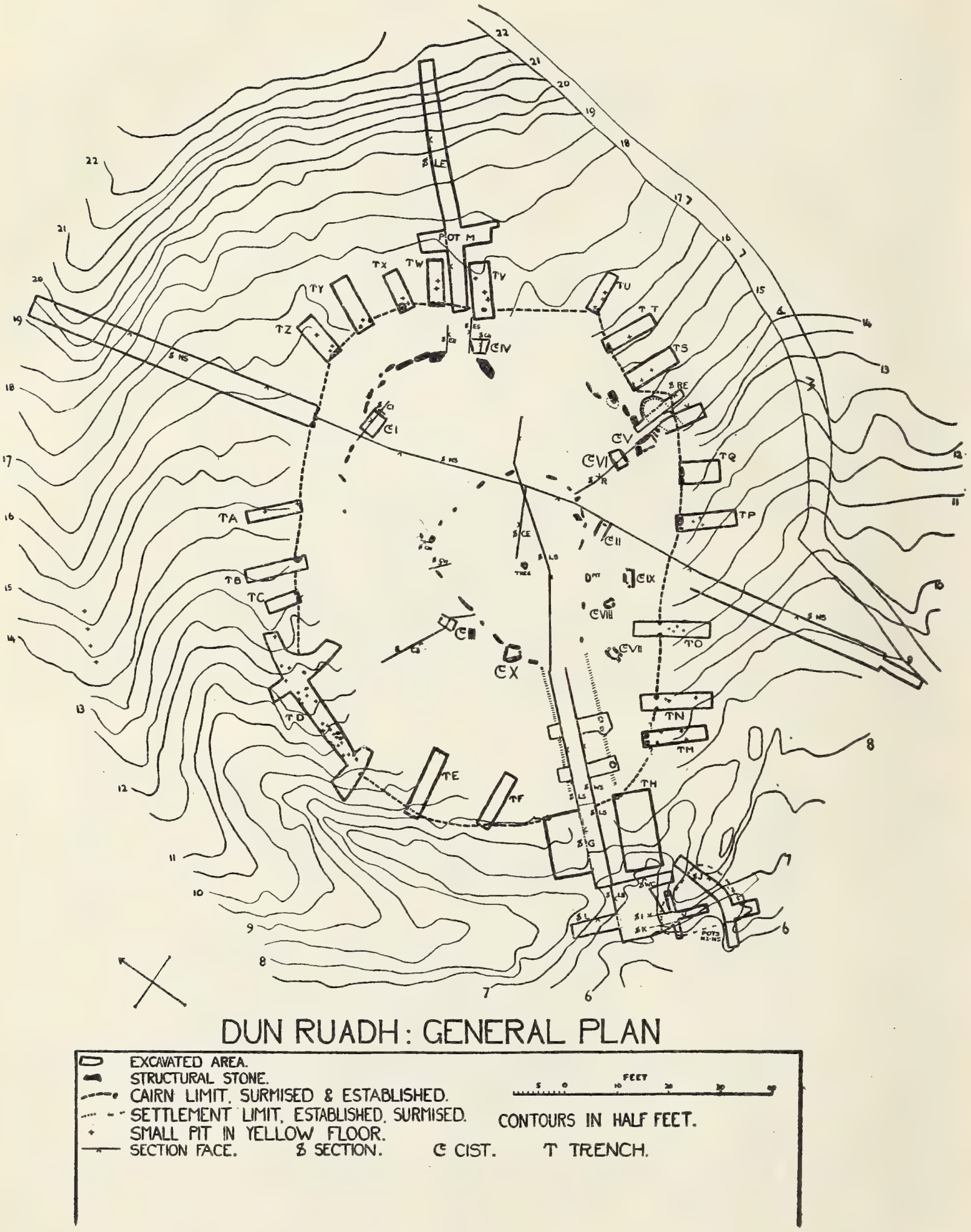
(3) Ruadh normally means "red," but in this case would then seem to have no significance. Mr. M'Aleer therefore derives it from an old Irish word meaning "royal."

(4) J. R. Soc. Antiq. Ireland, V, xviii (1909), p. 188, quoting Kyle's letter in Tyrone Constitution 19/6/1909.

(5) The label speaks of five urns and fragments of two others. 1909 39 and 40 are clearly parts of the same pot; there are also two unlabelled fragments, which may belong together and be connected with the sherds in cist V or VI.


DUN RUADH: GENERAL PLAN
EXCAVATED AREA.
STRUCTURAL STONE.
CAIRN LIMIT, SURMISED & ESTABLISHED.
SETTLEMENT LIMIT, ESTABLISHED, SURMISED.
SMALL PIT IN YELLOW FLOOR.
SECTION FACE.
Ꞩ SECTION.
Ͼ CIST.
T TRENCH.
FEET
5 0 10 20 30 40
CONTOURS IN HALF FEET.
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TB
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Fig. ii.

mud. 1909 35 36 and 37 have lichen near the rim, the other two none. This may indicate that the pots were standing upright, perhaps in a little water.

Prof. Macalister visited Dun Ruadh soon after, and gives a sketch plan.(6) The section does not exactly tally, and the downward slope of the ground east of the cairn does not correspond with the facts. The cairn is really oval, and the sides of the entrance are not as symmetrical as Macalister represents them. Nor could any trace be found that the cairn was laid out as a circle with excrescence, with a line dividing the two. Macalister planned what he saw, so did not insert the ringstones; it is clear that at this time they had fallen, and that a large part of the centre was filled with loose cairn. Following Mr. M'Aleer, he reports thirteen cists, but inserts on his plan only ten, which may be identified, from the right of the entrance round, as VII, VIII, IX, II, VI, V, IV, I. One of those on the west may be III, slightly misplaced, the other has not been identified; I saw both these in 1932, but I could not find both again during the excavations.

The cairn must have suffered some damage during the next twenty years; for when I visited it on behalf of the Ministry of Finance in 1932 only four cists were visible (one was probably V, one I, and two on the west). Cist I was still roofed. The hawthorn was growing at the back of a circular area 6′ across, and the entrance passage was 4′ across and walled with dry stones.

In 1935 it was determined to excavate the monument before it suffered further dilapidation. Mr. M'Aleer made all arrangements, and our best thanks are due to Mr. Morris for giving permission, and to Mr. Rogers with whom we stayed. The excavations were financed by the Belfast Museum grant for Prehistoric Research, the Archaeological Section of the Belfast Natural History and Philosophical Society, and the Government grant to relieve unemployment; Mr. Leo M'Aleer acted as foreman, and six or seven men were employed continuously. The work was carried out in September and October, 1935, and May, 1936, according to the programme sketched by Mr. Raleigh Radford, who visited the place during the course of the Clady Halliday excavations. I was assisted at various times by Mrs. Anderson, Miss Gaffikin, Miss Holton, Mr. H. Megaw, and several students of Queen's University, Miss Gillespie, Miss Hamilton, and Messrs. Bailey, Barbour and Burrows.

I may say in advance that Dun Ruadh was found to consist of a pear-shaped ring of uprights, covered by cairn and surrounded by a ditch and bank. If one could be sure that in a remote county like Tyrone food-vessels are subsequent to pottery not of the latest neolithic types, the cists and covering cairn must be considerably later than the ring, provided that the latter rests on a prepared floor and not on the natural subsoil. But it will be shewn below that this is uncertain; and the former assumption is not capable of absolute proof, because we know that the neolithic culture stagnated south of the Sperrin Mountains probably until an advanced date in the bronze age.

THE BANK AND DITCH.

Dun Ruadh is bounded by a low bank and internal ditch. The diameter of the former is about 174 x 152′. It is composed of yellow clay containing a few stones, which was rammed hard on the surface, and may have been originally covered with firm, dusty, grey earth, since denuded in many places (sections I, J, NS north).(7) In some sections it apparently rested on soft yellow subsoil, with an intervening occupation layer(8); in others the yellow prepared bank-clay seemed to lie directly on till.(9) But it is not always easy to distinguish natural from prepared layers.

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(6) Ireland in pre-Celtic Times, p. 349.

(7) In section NS north the orange and probably the grey seem to have spread outwards, so as to overlie the natural black subsoil.

In an examined area of the north-western part of the bank were found four holes 6″ deep, set somewhat irregularly 3-3¼′ apart. They were filled with soft yellow earth, which contrasted with the hard gritty material of the surrounding top of the bank; there was no black stain in them. They probably held a row of stakes, which thus enclosed the monument. These were set towards the outside of the bank, and as it has been much denuded, they would originally have been embedded to a considerable depth.

The ditch runs inside the bank not quite concentrically.(10) It may just be traced on the surface west of the cairn (see contours of general plan), but elsewhere is completely filled. Its depth is 2-3′ into till (sections NS, LE, G). Near the bottom it contains sticky grey silt, higher up drier grey or brown clay, usually with much slip from the yellow layer. Rank vegetation must at times have grown in it, as in section NS north there was a black peaty layer overlying the white silt(11), and in section G at a slightly higher level. In several trenches large boulders lay in the ditch.

At the entrance on the south-west (section LS, cp. G) the ditch is only 4′ wide and 1½′ deep, and filled with boulders, though it is not entirely interrupted. Section H (taken across the trench) shews that the bottom of the ditch slopes down sharply at 6′ south of section LS from 4·5′ to 3·5′ (4′ below turf); the slope on the north side was near section LS. Thus there was a partial causeway about 7′ wide.

Corresponding to the contraction of the ditch was a gap in the bank (cp. sections WC, I, L). The yellow subsoil is here missing, and the till seems to have been partially dug away, and is covered by hard gravel with much quartz thrown in to form a roadway. A flake of stained flint (4) found with this gravel is probably natural, or at least not used on the site.(12)

The shape of the ring, oriented as it were in this direction, makes it clear that the entrance was always on the south-west; thus there was a purpose in contracting the ditch to what might be called a symbolic size. It cannot however be proved that the bank was not at first continuous at this point. I suspect that the filling of the ditch with tumbled boulders and the cutting of the bank belong to the second period of Dun Ruadh, and are to be connected with the cobbled path through the cairn to the centre (see below); for frequent access would be needed for the construction of burials and of the cairn itself. It is indeed possible that the causeway across bank and ditch was made in modern times, to enable carts to remove stones; but it is further north, nearest to the modern lane (see map), that the cairn-edge has been so much disturbed that it is not traceable (see general plan); indeed in trench E there is no yellow layer. Nor is the bank now so steep that a cart could not cross it at almost any point.

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(8) In sections K and J the lower yellow with black and reddish pockets containing pottery seems to be natural subsoil disturbed by the pre-bank settlement; in section L there was a similar yellow layer, save that it contained no pottery. The white layer in section NS south contained specks of charcoal and one pottery fragment; in it was a discontinuous hard orange layer resembling iron pan and probably due to some sort of deposition. I am inclined to think that the white here represents an old surface, and the superimposed yellow of the bank has been mainly denuded to build the field-wall.

(9) In section LE it seemed possible to distinguish the pure yellow clay of the bank overlying the mottled yellow subsoil. In section NS north certain black spots in till which did not penetrate into the yellow seem to mark prehistoric pre-bank roots.

(10) Distance of centre of ditch from outer edge of bank about 16′ on west and south (section LS NS), 20′ on east (section LE), 24′ on north (section NS).

(11) Representing probably the accumulation of the first few years, until the angle of rest had been reached.

(12) There were also in the gravel fragments of oak charcoal.

South of the entrance we were at first deceived by the remains of a modern dyke, which cut off the corner of the field. It became however clear from section NS south that the original bank ran further out, and the suspicious curve of the field-boundary south-east of the cairn really followed the line of the ancient ditch (see general plan). The modern and ancient banks, however, apparently coincided beside the entrance, and the line of the latter may be seen on sections K and J.(13) It rests on a black settlement layer 1-3″ thick (309), which in its turn overlies what seems to be disturbed yellow subsoil with pockets of black containing pottery flints and oak charcoal. Close to the entrance (see special plan, sections I, K) the yellow and black layers disappeared; there were many deep-level stones and signs of burning with oak charcoal, and a structure resembling a small hearth (section I) with a patch of ash below it (308). The yellow subsoil was replaced by brown earth containing pottery, but still covered by the rammed yellow clay of the bank. North of the causeway the black layer was absent, but the yellow subsoil was still disturbed and contained a worked flint (29) (see section L). One may conjecture that the occupiers of the black layer excavated to till to obtain shelter for their hearth, and one side of this pit was dug away by the causeway builders.

The settlement must be earlier than the bank (section J). If it had been occupied while the ditch was open, pottery should have fallen in and been preserved, so that its absence in trench H proves that the ditch also is later. The black layer may have belonged to the builders of Dun Ruadh, or it may have been a casual unconnected encampment. It contained many fragments of pots N2-N5, burnt chips and flakes of flint, and hazel and oak charcoal.(14) Its approximate limits are shewn on the general plan.

FOUNDATION OF THE CAIRN.

Over the whole area inside the ditch the hard till is covered by a thick yellow-orange layer (see sections) varying in colour from pale yellow, usually near the base, to deep orange in places near the surface (cp. Central Plan for approximate area of the deep orange within the ring). Under the cairn alone a white layer ½-1″ thick, incorporating charcoal, sometimes overlies the yellow. Within the ring it is patchy (cp. Central Plan for its approximate area), but it may have been partly broken up in ancient times with the laying down of the cobbles. Outside it is more regular (sections NS ES R C3, not in EN CW), but it does not occur normally within the cists, where one would expect the floor to have suffered disturbance. Its presence above the neolithic pit in trench R shews that it is of later date than the earliest occupation of the site. It is suggested (see below) that it was caused by the burning of vegetation; and its coincidence with the extent of the cairn makes it probable that the area was ceremonially purified by fire.

The soil-section has been most kindly examined by Mr. R. H. Common, of Queen's University, Belfast, who reports as follows (cp. section drawings):—

" THE NATURAL PROFILE.

" The natural profile was observed about 50 yards from the cairn. The vegetation is rough enclosed moorland grazing, but it is improbable that the ground was ever cultivated, and there are no visible traces of draining.

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(13) The hard grey earth on the north of section J may not be ancient.

(14) The charcoal from Dun Ruadh was most kindly examined by Mr. M. Y. Orr, of Royal Botanic Gardens, Edinburgh.

" The top horizons (A) are an accumulation of turf with some peaty material; they are free from gravel fragments.

" The bleached layer (A_1) is of loose texture, and is much deeper than is usual in such profiles. However the A horizon is wide where rainfall is high and there is a fairly permeable C horizon.

" The B horizon is orange-red and of firm but not compact texture. Both A and B horizons are penetrated by well-developed roots. These have disturbed the junctions of the horizons to a slight extent, and there is no indication of a pan.

" The parent material is a very compact, heavy glacial till, pale greenish-yellow in colour, and containing gravelly fragments. The proportion of clay is not high, and it is more permeable than a clay drift. Roots do not appear to penetrate the till.

" The entire profile is strongly acid; the variations of acidity shewn by the pH values agree with the view that the profile is that of a heath podsol.

" SECTION BELOW THE CAIRN.

" The lower layers of stones in the cairn rest upon a curious white layer, and are embedded in a loose friable chocolate-brown gravelly earth. The latter may largely be regarded as material which has drifted down through the stones of the cairn in course of time.

" The white layer contains charcoal fragments, especially on the upper surface. It is firmer in the field than the subjacent dark orange layer, but crumbles readily to white powder on air-drying.

" The deep orange layer is of firm texture and free from modern vegetable remains; but old root-holes and large stones occur in places. It passes sharply into the till, though not more sharply than does the natural B horizon.

" The section is fairly acid throughout, though less so than the natural profile. This may easily be accounted for by the absence of organic acids percolating down from a vegetation layer and helping to leach bases.

" DISCUSSION.

" (a) The white layer quite clearly represents the site of fires sufficiently intense to affect the manner of subsequent weathering of the material. It cannot be regarded as a prehistoric A horizon.

" (b) The dark orange layer under the cairn may or may not be prepared. If it is not, it may be assumed that when the ring was constructed the section was the same as the contemporary natural soil-profile, subject to the proviso that the superficial layers might have been removed, thus truncating the profile. It may be pointed out that (i) the combined thicknesses of the A_1 and B horizons in the present natural profile are nearly the same as the combined thicknesses of the white and the dark orange layers under the cairn; (ii) no palpable difference could be detected between the material of the dark orange layer and that of the natural B horizon, except that the latter was slightly mottled with reddish spots.

" It could be assumed therefore that the dark orange layer below the cairn represents the natural profile during megalithic times, relatively little altered since then, especially as it is slightly darker towards the top, and that the present natural profile is derived from the same original profile by the more intense soil-forming processes under cover of vegetation. This assumption implies that the 21 cms. of bleached A_1 horizon in the natural profile have been formed almost entirely since the construction of the cairn, and that little bleached layer was formed during Atlantic times. There is remarkably little evidence, however, as to the rate at which such a bleached layer may be expected to form."

Against Mr. Common's suggestion that the yellow-orange layer is not artificial the following arguments may be urged, to support the view that the subsoil was removed, purified, and laid down again as a prepared floor. This would have taken place at the time of the construction of the ring, and so probably a good while before the formation of the white layer to receive the cairn, so that there would be time for pits to be dug and deep-rooted plants to grow on the yellow:

(i) In the yellow were found occasional fragments of hazel charcoal.

(ii) In section LE it was thought possible to distinguish the mottled yellow subsoil from the pure yellow of the bank. The contents of a pit in till near the north side of the cairn on section NS resembled closely the yellow material with black patches from the bottom layer of trench J, believed to be natural subsoil; they were covered with pure yellow earth, which might therefore be presumed to be an artificial floor.

(iii) An undoubtedly worked flint (215) was found below the yellow layer on till in trench LE, 17′ outside the edge of the cairn, but within the ditch. This was the only artefact lying at an appreciable distance below the top of the yellow, save where disturbance could be proved.

(iv) On sections CN and C3 the ringstone backs against a sheer wall of yellow earth, which is more likely to occur if the yellow was laid down after the stone was set upright than if pits for the stones were dug; the same observation was made with regard to the last ringstone to the south of the entrance. The pit for the missing ringstone next but one to it had sheer walls on all sides. If the disturbed pit on section LS is the socket of the ringstone, the yellow must almost certainly have been laid down at the same time as the stone; but I am inclined to think that this ringstone is reconstructed in situ. The ringstone on section NS south must have fallen and been reset, as it rests in a wide shallow pit, filled with yellow-brown earth, below which the white layer follows the contour of the pit and overlies the yellow; thus when the white layer was formed the pit was open.

Thus the evidence for a prepared floor, consisting probably of the original subsoil levigated, is uncertain. Prepared floors have been found in several Irish and English megaliths, and I am inclined to think that the positive archaeological arguments adduced above outweigh the negative pedological doubts of Mr. Common.

In various parts of the floor of the monument pits had been dug, which were filled usually with large stones and yellow-brown earth. Many of them are near cists, but this may be due to the more thorough investigation in these places, and there seems to be no essential connection.(15) The most extensive disturbance was in trench R, where the yellow layer was dug out to give a stone-packed foundation for a black occupation stratum with many pieces of pot N1, flint chips and flakes(16), and specimens of hazel, oak and birch charcoal.(17) Pots N7 and N8 were found in a pit south of cist I (section NS), which was filled with packed stones; with the sherds were pieces of hazel charcoal. These pits seem to represent habitation areas, like the one at the entrance; there was another with much charcoal, worked flints (250, 252), and pieces of pot N6 on the surface of the yellow just outside the ringstone on section LS. If they were temporary settlements, pottery would not have been broken in all of them. If the yellow layer is a prepared floor, the neolithic pottery in the pits dates it and the ring; otherwise the ring might not be much older than the cairn, but one must then assume an extraordinary concentration of habitations all over this exposed hillside, for there would be no reason why the encampments should be on the site of Dun Ruadh rather than elsewhere. There is one last possibility, that before becoming a megalith Dun Ruadh was a neolithic village, and the habitation layer, except for the deeper pits, was removed when the cairn was constructed. But it is not parallel in shape and size to the neolithic camps in England; and a ditch, especially if internal, would almost certainly become filled with all manner of habitation refuse.

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(15) The pits within the ring are indicated by the areas of deep-level stones on the central plan. There is a pit under the hawthorn in the centre of the monument, containing mixed yellow earth and a few scraps of oak charcoal and pottery; but it does not seem significant, as might be suggested by its position. Similar finds were made in a pit on the north side of the ring on section NS. Deep pit beside cist IV, containing hazel charcoal, indicated on special plan and section ES. Pits on sections C1 and C3; the latter contained charcoal and indeterminate fragments of pottery. Two pits on section LS containing oak and hazel charcoal; one of them had scraps of black pottery. On section NS, slightly north of the ring a pit containing many tightly packed stones descends into till, but the yellow layer there shewed no signs of disturbance.

(16) One may be a rough end-scraper. There was also a rolled white pebble.

(17) There was a slight modern disturbance in this pit, as at one point in the black layer was a fragment of glass. This may have been due to mice.

The Ring.

Approximately in the centre of the monument was a pear-shaped ring of seventeen stones, one of which is missing. These were mostly found leaning inwards, and have been reset as near as their original positions could be ascertained (see central plan). They are usually bedded in the yellow layer, but to no great depth. In some cases backing stones were found on the outside, and they must have been wedged on the inside of the cobbling, which seemed to rise slightly towards them on the east; but there were no deeply set wedgestones. Between some of the ringstones were found long slabs 3″ thick and 4″ broad, spanning about two-thirds of the distance between stone and stone. They rest on the yellow (sections R and NS), in one case one was superposed on another. They almost certainly represent the bottom courses of dry walling, which Mr. M'Aleer think used to exist to a considerable height; such stones are well shaped for building, and would be among the first to be robbed. I suspect that this walling was intended to hold back the cairn, to which it would belong; but if the centre was covered (see below), the walling may have formed part of the original ring.

Mr. M'Aleer is positive that in his youth there was a passage round the centre (see above), and thinks that the outer and inner walls of it were formed of upright stones. In the floor no indication was found of another ring. Reasons will be given to shew that the central area was cobbled up to the inner face of the present ring; outside it bedded cairn, with large blocks set aslant in sticky brown clay, started immediately. The only traces that we could find were four upright stones 2-4′ high, one on the north and three on the south-east. The former rests on a pit 1″ deep in the white, and is surrounded by bedded cairn to at least half its height (section CN, which shews its base at the side and not in the centre). The stone nearest cist II rests on brown cairn-bedding (section C2; this is believed to be a natural deposit, see above). The other two were at a high level, though beneath the more northerly there seemed to be a bedding of smaller stones (sections R, NS).(18) In addition two long stones were lying loose in the cairn south of cist II; they might have been uprights. If the four stones mentioned above formed part of the outer ring, the absence of bedding shews that this cannot be connected with the inner, but must have been used in the construction of the cairn; further, the passage would have been extremely narrow (about 1′), and its floor would have been formed by bedded cairn. I therefore prefer to think that the ring formed the outer wall of this passage, which was bounded on the inside by a stone-stack recently constructed by cairn-robbers.

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(18) On section NS there is a shallow pit in the floor between the ringstone and cist II, which may have held an upright. Behind the missing ringstone are three uprights not more than 2′ high and resting on yellow, which might be included, but they hardly appear to be important structural stones.

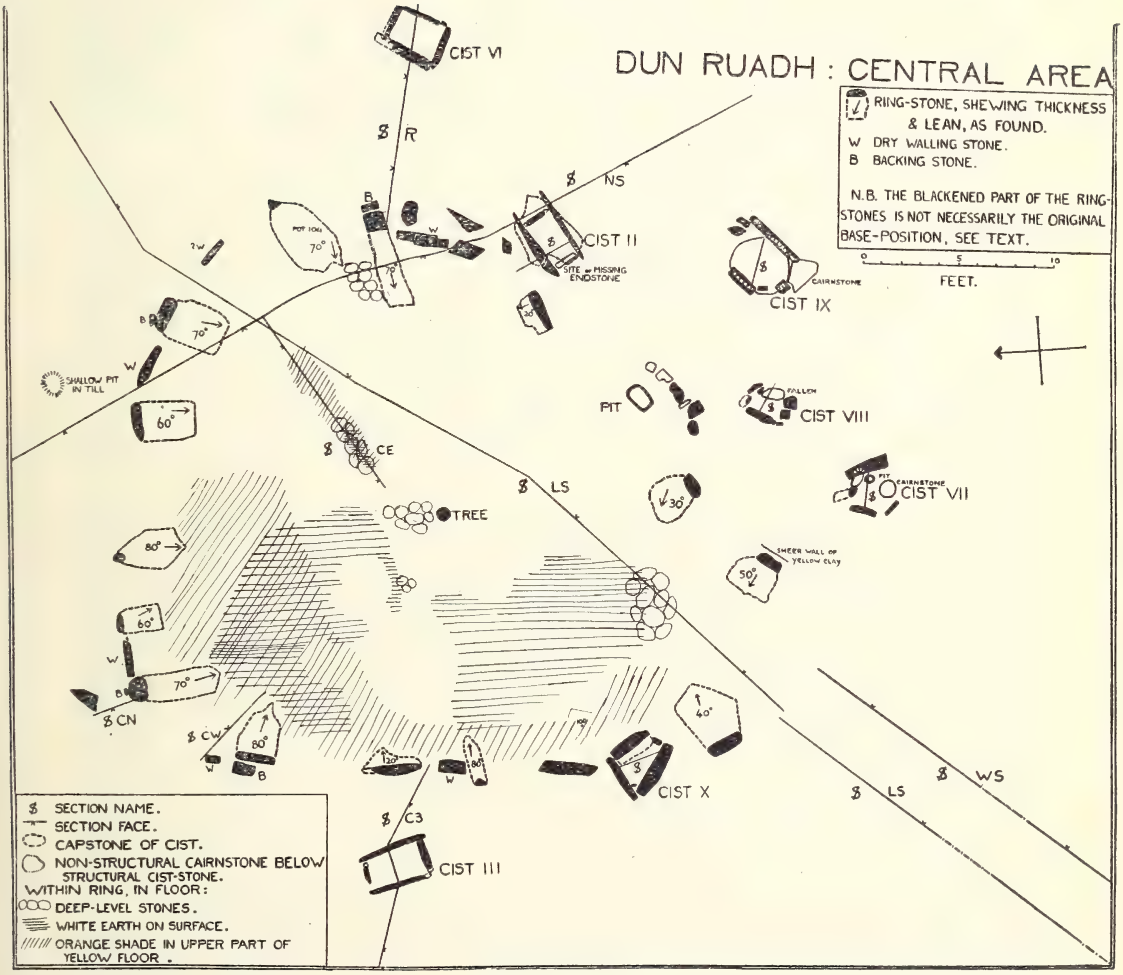
DUN RUADH : CENTRAL AREA
RING-STONE, SHEWING THICKNESS & LEAN, AS FOUND.
W DRY WALLING STONE.
B BACKING STONE.
N.B. THE BLACKENED PART OF THE RING-STONES IS NOT NECESSARILY THE ORIGINAL BASE-POSITION, SEE TEXT.
0
5
10
FEET.
CIST VI
$ R
$ NS
CIST II
SITE of MISSING ENDSTONE
CIST IX
CAIRNSTONE
B
W
?W
POT 104
70°
70°
B
70°
W
SHALLOW PIT IN TILL
60°
20°
PIT
FALLEN
CIST VIII
$ CE
$ LS
TREE
30°
PIT
CAIRNSTONE
CIST VII
80°
SHEER WALL OF YELLOW CLAY
50°
60°
W.
B
70°
$ CN
$ CW
80°
W
B
20°
W
80°
100°
40°
CIST X
$ LS
$ WS
$ C3
CIST III
$ SECTION NAME.
SECTION FACE.
CAPSTONE OF CIST.
NON-STRUCTURAL CAIRNSTONE BELOW STRUCTURAL CIST-STONE.
WITHIN RING, IN FLOOR:
DEEP-LEVEL STONES.
WHITE EARTH ON SURFACE.
ORANGE SHADE IN UPPER PART OF YELLOW FLOOR .

Fig. iii.

Both the central area and the passage to the entrance were cobbled with small stones; these were missing over a small space close to the northern ringstones. The cobbling rested on the yellow, and was set in brown clay less sticky than that at the base of the cairn. It disproves the idea of an inner ring, and shews further that the central area was originally free of cairn, and was filled more recently with loose material(19), for cairn cannot be bedded on cobbles. It is significant also that all the ringstones were found leaning inwards and that grass was growing recently against their inner faces. The entrance-passage from its profile is likely to have always been open, as cairn-wreckers do not make a regular passage with parallel sides opposite an original causeway of the ditch; and if the centre had been closed, it is unlikely that the passage to it would not be also. The fact that Mr. M'Aleer does not remember the centre open shews that the cairn had been seriously tampered with before his time.

On the white or yellow layers or in shallow disturbed pockets in the yellow, below the cobbles, were found within the ring specimens of oak, hazel, birch and willow-poplar charcoal and two worked flints (100, 109). In the entrance-passage there were several indeterminate sherds and oak charcoal at the junction with the ring, and further out three flints, one of which is certainly a worked flake. On the cobbles or in the black earth surrounding them was oak charcoal in the entrance-passage, in the ring charcoal of hazel, oak, birch and willow-poplar, and a flint flake and two chips, one burnt. Thus the material for dating the cobbling is inadequate. It is later than the pits in the floor and than several worked flints; from the way in which it shades off into the cairn along the entrance-passage (see below) one would expect the two to be contemporary.

THE CAIRN.

The cairn material is loose, even under the turf east of section NS, where it has not been disturbed recently. Parts of it have probably been tossed, but in general the stones and clay of the cairn bedding were found intact. The base of the cairn consists of large stones set firmly aslant and resting into the yellow floor; round them was sticky brown clay (cp. section NS), which Mr. Common thinks is fine earth washed down from above and compacted rather than a prepared sealing layer (see above). The cairn-stones were mainly quarried. The middle levels consist of dry stones with a few fragments of peat, towards the surface there is a little earth. The loose and disturbed nature of much of the cairn is shewn by the find of a piece of modern glass not far above the brown bedding north of cist VI. From the same approximate level came a number of bones of rabbit, dog, pig, ox, and sheep or goat(20), some hazel charcoal and a flint flake. These had probably been thrown on to the cairn off the fields and had made their way down to the base of the loose stones; some of them may have been buried in the cairn at the time of its disturbance, for instance there was an almost complete skeleton of a dog at a fairly high level on the south-east side. We found also among loose stones between cists II and VII a piece of cremated human bone, probably thrown out of one of the cists when they were rifled.

The cairn was not bounded by a kerb; this is probably a late feature. Except where seriously disturbed its limits could be determined by the presence of bedded stones resting on the yellow (see General Plan). In many places round the cairn were found holes about 6″ deep in the yellow layer (shewn with crosses on the General Plan). They were filled with the same material as the surrounding stratum, and were distinguishable only by the softer texture of the earth. If they had contained posts, these could not have stood in them for a long period because the soil was not discoloured, and they could hardly have served a wider purpose than that of marking out the cairn.

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(19) It is not improbable that loose cairn, perhaps slip, had for some time covered the eastern edge of the ring, as at the base of the stones on section NS was similar brown rain-washed clay to that under the solid cairn.

(20) The human and animal bones from Dun Ruadh were most kindly examined by Prof. T. Walmesley.

Inside the cairn on the north is a row of upright slabs about 3′ high (see General Plan and section EN). These are bedded on brown earth, though the wedge-stones beneath one rest on yellow. The row ends 5′ from cist IV, and one or two stones in a corresponding position on the east side of the monument can hardly be regarded as its continuation or as more than bedded cairn. There were no certain uprights beyond cist I, as the stones there discovered resembled bedded cairn-stones. The uprights can hardly have had a structural purpose; the cairn would have held as well without them, and did so elsewhere. While wishing to avoid theories, I may point out that they may stand in significant relation to cists I and IV, two of the best constructed, and that the latter is in line with the entrance-passage.

No definite boundary of the cairn was found along the entrance-passage. On the east side were two or three spaced pits in the yellow 2-3″ deep, but they seem to represent the sites of bedded cairn-stones. On the north no pits were found, and at the eastern corner of junction with the ring the cairn seemed to shade off into cobbling, being distinguished from it by a bedding of brown earth instead of black loose material round the stones. We could not find traces of dry walling along the passage. It is even more surprising that the cairn was not defined here than round its edge; but it apparently sloped down to the cobbled floor. Its line can be fixed approximately at 5′ east and 4′ west of section WS.

The cairn can be dated roughly, in that it overlies pits containing neolithic pottery on sections NS and R. Below it there were found on the white or yellow layer, where it has not been disturbed, specimens of hazel and willow-poplar charcoal, flint cakes and chips, and a small flint borer.(21) Further, the bronze-age cists must have been built contemporaneously with the cairn. It has been suggested above that cists I and IV are primary; the former is set so far from the edge of the cairn that it cannot have been inserted, and it is the most carefully constructed, with its double row of corbel-stones. The other two well-built cists (II and III) may have been inserted if the centre was open, though they are surrounded by bedded cairn. Cists V-X are much rougher, and some of them can hardly be described as more than hollows in the cairn. It is possible that for further burials areas of cairn were removed and replaced; I consider it more probable either that the cairn was added to from time to time, or that its foundations were laid, the burials inserted as required, and the whole finally was sealed with loose stones.

Cist I (see special plan and sections NS, C1) is well built of four upright slabs, on which there rested thin corbel-stones to support the roof; the western one had apparently fallen into the cist. It was roofed by an irregular slab of schist 3′ 10″ x 3′ x 4″, which we found lying in the cist and removed before excavation. It was in place in 1932, though the cist had probably been rifled in 1909; it has now been restored, with initials on the under side to shew that it had been moved. The longer sidestones are not deeply bedded and rest on yellow-brown earth. On the east are two end-stones, resting just into yellow floor, the western end-stone is set deeper and wedged with small stones; no disturbance in the floor could be traced to prove its insertion, though it was surrounded by a very thin layer of black earth, probably due to old roots. Although the yellow floor had suffered considerable disturbance outside the cist to the west (sections NS and C1), it seemed fairly pure inside, save for a patch of grey clay with charcoal at some depth near the centre; but the white layer was absent. A few flat slabs were probably part of a rough paving. On the yellow layer were found some minute fragments of pottery, hazel charcoal, six flint flakes, two of them burnt, and a small scraper (115); lying on the north sidewall was another scraper and an indeterminate flint (113). It is fairly certain that one of the pots in Dublin Museum was found in this cist. There was no sign of bones. The cist was filled with black earth and loose stones.

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(21) 47, from black earth just outside cist I, whence it had perhaps been thrown out recently.

Cist II (Central Plan, sections C2, NS) is a massive structure, which has been rifled by removing one end-stone and perhaps by splitting the roof. The position of the missing end-stone is marked by the line of cairn, which abutted against it as it does against the sidestones. The latter rest on the brown earth which forms the floor of the cist, the remaining end-stone is set a little deeper but does not touch the yellow. Under all the slabs, however, are wedge-stones slightly sunk into the yellow layer. Above the yellow on the floor of the cist is a patch of yellow-brown overlaid by white; the curious line of these layers suggests that there was here some unevenness or construction in the floor when the site was prepared for the cairn. Above the white layer were irregular paving-stones, and then brown earth containing many fragments of burnt human bones; Prof. Walmesley reports that the supraorbital ridges indicate an adult male. Near the surface of the brown layer were unburnt ox and sheep bones and pieces of a rusty tin; these were probably thrown in when the cist was opened.

Cist III (Central Plan, section C3) is fairly well constructed of four rather uneven slabs; the capstone was found leaning into it and has been restored. The northern endstone is bedded deep on to intact yellow, but the filling beside its inner face is soft and disturbed. The whole floor is probably impure, though the other stones do not rest in it to any depth; round the stones themelves was a thin black layer perhaps due to old roots.(22) Apparently the stones were uneven and corbels were not used, so it was necessary to dig down the foundations of the uprights so that their tops should be level. Near the surface of the cist floor were found fragments of well incinerated human bones and a piece of pot 1909 38, which was probably broken when the cist was rifled.

Cist IV (Special Plan, sections C4, ES) is the last of the well constructed cists. The sidestones rest on a thin layer of brown earth; but owing to the pit in the yellow layer below it is difficult to trace further disturbance. It was impossible to reach till inside the cist. The south sidestone is wedged at one end by a small slab. The capstone was lifted by us and replaced at the end of the excavation. A very large stone lying south of the cist is probably fortuitous cairn-bedding. The cist was apparently unrifled; it was paved with small flat slabs, on which rested a complete food-vessel, slightly south of the centre of the cist (cp. Special Plan and section C4). It lay on its side, and contained a little brown mud with a few beetle-shells. Bones and charcoal were not found.

Cist V (see Special Plan and section R) is irregular and badly built, with an unsuitably large stone on the west, and two small stones on the south which may form a substitute for a side-wall or be the backing-stones if it is missing. Some of the stones are just bedded into the underlying yellow-brown. No roofstone was discovered. The area was disturbed recently, as the brown earth towards the base of the cairn is broken up round the cist. On the east is an upright pillar 1½′ high, which probably formed a mark for the cist. There was a similar pillar on an unpublished grave-tumulus at Aghascribagh, though such were not found beside the other cists at Dun Ruadh. The cist is close to the edge of the cairn, so the pillar might have been visible above it. The filling was loose brown earth and stones; recent disturbance has probably caused many pieces of bone to sink into the floor. A few small slabs on the floor may be the remains of a paving. The floor consists of 1″ of mixed yellow earth, overlying the previously disturbed yellow layer, which is here brownish in colour. On and in it were found two fragments of coarse pottery, one of them part of a groove or rib; the type is otherwise unrecognisable, but the texture appears bronze age. In addition there was a piece of flint, and many cremated adult human bones, perhaps female.

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(22) Roots could hardly have reached to this depth while the cairn was intact, as deep-rooted plants would not have been able to grow on it. Nor is a matted layer likely to have completely rotted in the time, if subsequent to the rifling of the cairn. The black lining of the stones is therefore strong confirmation of the suggestion made above that the cairn was at first flat and subsequently heaped up to conceal the cists.

Only the north stone of cist VI is set as much as 1″ into the yellow layer; the others rest on the yellow-brown flooring of the cist. The heights of the stones are irregular, and the west wall is double; on it there lay a long slab, probably a corbel, but no other trace of roofing survives. The sidestones must have been built up considerably if one slab covered the cist, as the south stone is 6″ higher than the corbel; but the roof may have carelessly leant against it instead of overlying it. On the north the structure was felt to be weak, especially in the north-west corner; so the walls were backed inside with a bank of yellow-brown clay and tightly set stones. The cist was filled with mixed brown earth containing pottery and bones, underlying a few loose pebbles which had probably fallen in. At the base of the brown was a yellow-brown floor 2″ thick, which may have been laid down for the cist or been the result of earlier disturbance; below it was the undisturbed yellow layer. Some bones and two flint flakes were found almost outside the south-east corner of the cist; but they may have been carried through the gap between the sidestones by natural agencies. The bones are cremated, and belonged to an adult human. Prof. Walmesley suggests that they had been disturbed, as skull and limbs were found caked together in earth; but this disturbance may have taken place when they were deposited, as there is no evidence that they were cremated in situ.

Cist VII (Central Plan and section C7) may hardly be described as more than a hollow in the cairn, of which one or two stones seem to underlie it; three or four uprights were apparently inserted, and the whole was probably roofed. It was filled with loose stones and earth, with a sticky brown layer at the base, probably due to infiltration as in the cairn itself (see above). This overlies the undisturbed yellow floor, with some white on its surface. The cist was floored with small stones, save for a pit towards the east, which may have been made to receive an urn, or have been the bedding of a large cairn-stone removed in the construction of the cist.

Cist VIII (Central Plan and section C8) is as irregular as VII, and seems to have been patched up, probably making use of cairn-stones already in situ. One sidestone is recumbent; this probably fell after the pot broke, as only one sherd was found beneath it. Outside it on the section is shewn another flat stone, probably of loose cairn and not significant. The cist was filled with brown earth containing charcoal and many fragments of a food-vessel. This overlies a mixed yellow layer, which may have formed a floor; below it was the regular compact yellow stratum, on which the sidestones rest.

Cist IX (see Central Plan, section C9) is very roughly constructed, and all the sidestones save the south-eastern are horizontal, and resemble bedded cairn with brown clay surrounding them. The cist is probably a hollow in the cairn with one side-slab. The floor consists mainly of a large stone set into the yellow layer, which covers it at the edges where it sinks; in one corner of the cist, which the stone did not occupy, there was a patch of white. The stone must have formed part of the original yellow layer, too deeply bedded to extract. If the yellow is natural subsoil, it could be an erratic; but it was impossible for us to lift it without destroying the cist. On the western corner of the large sidestone leans a flat slab; this may have been a roofstone thrust aside. The cist was floored with a thin brown layer, above which was black earth containing loose stones and many fragments of incompletely cremated human bones, probably of an adult male. With them were one or two pieces of rusted sheet-iron, certainly intrusive.

Cist X (see Central Plan and section C10) is better built than VII-IX. It must have protruded slightly into the ring, and if this was not covered, it may have been incorporated in the dry walling which held back the cairn. In its position therefore it strongly resembles a late insertion. The sidestones are bedded into pits in the yellow floor, and were packed with mixed yellow and brown earth. The slight pit in the centre may have held an urn. The cist was empty save for a little charcoal.

General Conclusions.

The evidence presented above points to there having been two periods in the construction of Dun Ruadh. If the yellow layer under the cairn is a prepared floor, the ringstones, against which it abuts, must be neolithic, as in the floor were dug pits containing neolithic pottery. If the yellow layer is mostly or entirely a natural subsoil, the ringstones could have been set up at any period previous to the ceremonial purification of the site by fire which formed the white layer. On the other hand, it is still unlikely that the ring belongs to the same series of structural acts as the building of the cairn. For this would imply the following sequence of events: (a) careful removal of all humus from the site, so that when the ringstones were set and the outcast from the pits rammed back again, the earth should appear in no way disturbed; (b) setting of the ringstones; (c) packing them round with outcast; (d) purification of the site by fire; (e) removal of the remains of the fire, save for a little charcoal embedded in the presumed B horizon of the subsoil. This series, and especially the care with which prehistoric man covered up his tracks so as to deceive the XX-century archaeologist, is unnatural and unlikely; but a more probable sequence can be worked out if the ringstones were erected at an earlier period than the construction of the cairn. Thus, whether the yellow layer is or is not a prepared floor, we may assume it to be practically certain that the ring was once an independent monument.

Both ring and cairn are eccentric to bank and ditch. The latter cannot be dated. Though there is a fairly advanced neolithic settlement under the bank at the entrance, the bank itself could still be neolithic. We did not have the good fortune to make accurately datable finds in the ditch; a flint scraper (217) occurred fairly deep in the silt on section LE, on the hill-slope where the ditch would have filled rapidly, but it is not typical. It is unlikely that the bank and ditch belong to a different period from both ring and cairn. If they are contemporary with the cairn, one may cite as parallels the English ditched barrows, but ditches have not so far been observed round Irish megaliths. But the ring is then unparalleled, because it is not circular, and certainly does not connect with the series of circle-alignments so common in Tyrone. If the bank and ditch belong to the ring, one obtains a Henge type of monument, perhaps remotely connected with Giant's Ring and Lyle's Hill, more closely apparently with a wooden circle with bank and ditch recently excavated at Bleasdale, near Preston (Lancs.).(23)

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(23) Varley, Proc. British Ass. Advancement of Science (1936), p. 388.

The cairn and cists belong to the class of multiple bronze-age burial cairns, like Aghnaskeagh A (Co. Louth)(24) and Poulawack (Clare)(25); another is probably Killoran in Goles, some seven miles from Dun Ruadh. But in Ireland no example is known of the superposition of a cairn on an earlier monument. One may cite as parallel the bronze-age cairn of Kilmartin (Argyll), containing two eccentric rings of uprights(26); but there was no evidence that this monument was constructed at two periods. There are also the recumbent circles, believed to be late bronze-age, with bank and ditch, ring-cairn and hollow centre bounded by peristalith; but they also would not account for the neolithic sherds at Dun Ruadh. The idea of Dun Ruadh may rather be compared to that of a modern church-yard; but a sacred place within which burials were made was unusual in prehistoric times, as normally the construction of the burial in itself sanctified.

DUN RUADH AS RESTORED.

The four best-built cists have been left with parts of the capstones shewing, the other six are marked by pillars which have been dated. A dated pillar also indicated the position of the missing ringstone. The ringstones have been set up, and the ring has been left free of cairn and recobbled at a higher level than the old cobbling which was largely removed during the excavation. The cairn-stones have been entirely replaced outside the ring, and extend not quite as far as the ascertained original limit of the cairn. At the wish of Mr. Morris, the small patch of turf and the cairn underlying it was not disturbed, most of the rest of the loose cairn was turned over. The small uprights set up by the workmen at the entrance have no significance.

THE POTTERY.

N1 a-b. Fragments of shouldered neolithic pottery from the pit in Trench R and RE. Though such pots are often asymmetrical and different parts of the rim vary considerably, the variations in this case are so great that I think that two pots must be represented. It is however impossible to sort out the smaller sherds, or to attribute either of the shoulder-types to any of the rim-types. No local separation was possible. There are not a large number of sherds of either pot.

The colour varies from red to grey-black, some pieces are sooted on the inside. Especially round the neck, the outer surface was highly polished; other sherds are merely smoothed, and sometimes weathered. The biscuit is grey or reddish, the thickness ·2-·45″. The shape is probably a wide round-bottomed shouldered bowl. The shoulder is not pointed, the rim rolled, the neck concave but of uncertain height. In one sherd a hole is bored ·5″ below the rim, as in one of the pots at Ballyalton.(27)

The site at the entrance yielded a large number of small fragments of unornamented pottery. It is impossible to sort them out, owing to the unevenness of neolithic ware. At least four pots (N2-N5) are represented, and there may be more, which have left no pieces with characteristic shape; there is not a great deal of each pot. I have combined rims and shoulders as they appear to belong. There are some flat pieces, but they could be neck rather than base, as at least one pot had a wide uncurved neck.

The pieces assigned to pot N2 came mainly from the north-west part of the site at the entrance. The colour is grey, sometimes black inside, two pieces probably of neck are much sooted. The pot is generally fairly hard and well baked. The biscuit contains much grit, the thickness is ·2-·3″. This pot had a relief-shoulder with slight groove beneath, shewing that it was pinched out between finger and thumb. I am inclined to assign to it a piece of bent out rim, undecorated, but otherwise rather of bronze age than of neolithic type.

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(24) Evans, County Louth Archaeological Journal (1935), p. 235.
(25) Hencken, Proc. R. Soc. Antiq. Ireland, LXV (1935), p. 191.
(26) Childe, Prehistory of Scotland.
(27) Pot A2. Proc. Belfast Natural History Soc. (1933/4), p. 79.

N3. Some rather thicker pieces than those of N2 (·3-·4″, save at the neck) should be assigned to a separate pot, though they came from the same area as the last. The colour is red, sometimes black inside; the biscuit is crumbly and soft, with much grit. There are two fragment of rolled rim and two of wide shoulder, almost ledge-shaped, which strikes me as of fairly late date in the neolithic period. The neck was slightly concave.

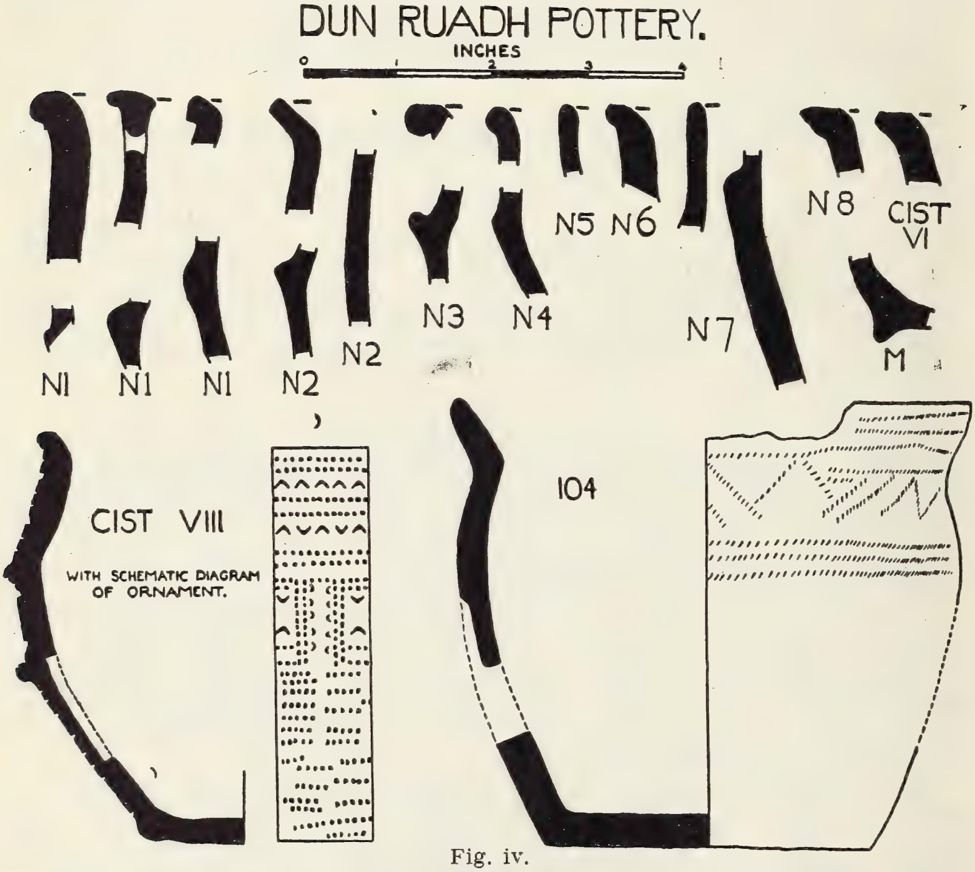


Fig. iv.

N4 is also a wide shouldered bowl. The sherds assigned to it are almost exclusively from trench J. The colour is red, the thickness ·18-·3″; some pieces are rather crumbly; the biscuit contains a little sand. There are fragments of a slightly rolled rim and of a relief shoulder; the neck was concave.

N5 seems to be the plain rim of a small shoulderless bowl; some shapeless fragments may belong to the same pot· The surface is rather uneven, but well preserved and perhaps pebble-polished. The colour is red, the thickness ·18″; the clay contains no grit.

N6. Some small red sherds of ·23-·35″ thickness were found in the disturbed layer just outside the ring on section LS. The surface is smoothed but not polished, the biscuit contains little grit. There is one piece of bent out rim with thick neck. It certainly is not bronze age, but does not suggest the ordinary type of shouldered neolithic pottery, though it is too small for certainty to be attained. It may have been a small round-bottomed shoulderless bowl.

In a pit north of the ring on section NS were found many sherds. Apparently nearly all should be ascribed to pot N7, though there is one divergent rim which I have named N8.

N7 was a shouldered bowl, probably round-bottomed, and of diameter about 9½″ at the lip. The biscuit is dark grey with many quartz pebbles. The colour varies from red to grey-brown, and is sometimes black inside, often sooted. The surface is slightly polished though rather irregular; it seems to have been smoothed with a tool leaving fine striations, such as a rather jagged stick. The rim is plain, curved on top, and ·19″ thick. The neck was vertical, the height just over 1·3″. Below it was a ledge-shoulder and incurving body ·3-·35″ thick.

N8 is a piece of flattened splaying rim. The surface is red and undecorated. though somewhat irregular. The biscuit contains no grit. The profile does not look neolithic, but the sherd was found in close association with N7, and must be earlier than the cairn. N7 is not of the regular Ulster neolithic type, though at a guess one might date it very early. When however we come to know more of the archaeology of Tyrone and Derry, we may find parallels at the end of the neolithic period, which is probably contemporary with the bronze age in the coastlands.

The eight pots described should be assigned from their type or their stratigraphical position to the neolithic period, before the construction of the cairn. We will now proceed to the food-vessels, which were probably all found in cists in the cairn itself. The first three to be described are reconstructed in Belfast Museum, together with the fragments from cist VI. The others are in Dublin.

140 was found complete in cist IV; the rim is a little uneven, and is cracked and chipped in places. The colour is reddish-brown inside and outside, the paste soft and flaky, the thickness ·3″. The shape is squat, with a deep groove round the middle and shallower grooves near the lip. As on many Irish food-vessels, the base is ornamented with an irregular star. The walls are richly decorated in horizontal zones, largely with punch-marks which seem to have been applied with a small blunt-toothed comb. Above the upper band of chevrons they appear irregular, and are not grouped into straight lines; above the lower the comb was probably applied diagonally in two directions, so as to give the appearance of lack of pattern. Details of the decoration may be seen in the illustration.

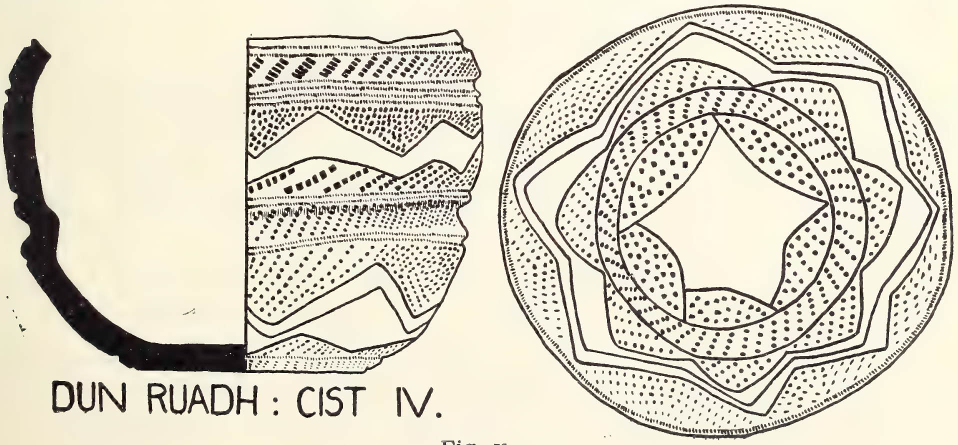

DUN RUADH : CIST IV.

Fig. v,

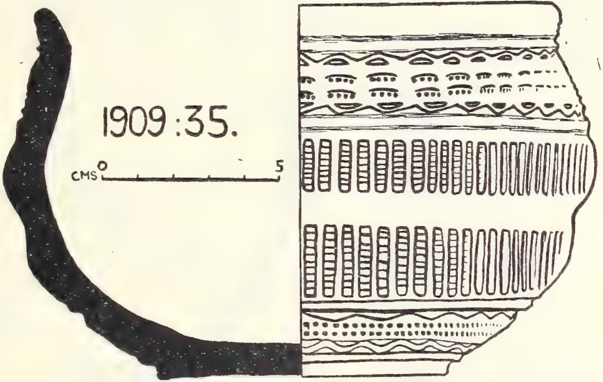
Many fragments of 180 were found in cist VIII. The pot has been patched together in the Belfast Museum for purposes of illustration, though many of the sherds do not join; the illustration is also composite. The biscuit is very crumbly, and has usually split down the middle owing to bad baking. The thickness is ·3″. The vessel is less squat than 140, the total height was about 4·1″, the diameter of the lip 5″, the external base diameter 2·4″. The base is raised on a slight ring. The colour varies from yellow to red-brown. The decoration is in friezes, and consists of comb-marks and impressed circles. The comb was five-pronged, with teeth of square section. Along the horiontal lines it was often applied with great regularity. The space between the ribs was bridged with vertical lugs, of which two survive; it is impossible to tell whether there were originally as many as four, but it is unlikely that there were more. These lugs are unperforated, and so may be described as stops. Abercrombie illustrates many such, and there are several in Belfast and Dublin Museums, e.g. from Croghan near Strabane (Tyrone), Moytura (Mayo), etc. Sometimes they bridge a deep groove, like three in Dublin with ornament slightly more degenerate than that from Dun Ruadh, 119 1915 from the Day Collection, and from Moville (Donegal) and Gortnahoon (Galway). They thus connect with Dun Ruadh pot 1908 38, where however the lugs are perforated, a much rarer type to be discussed below. Unperforated vertical lugs were also found on the ungrooved and panel-decorated pot G from Ballyalton, which is certainly of an earlier type, while its panel-decoration connects with that on the pot from Donegore (Antrim).

Fragments of pot 104 were found below the base of the leaning upright in the south-eastern angle formed by sections NS and LS; near by was a pocket of sticky pink clay, well levigated and homogeneous. These lay below the cobbling and just below fairly recent grass-roots. They were probably buried by the upright when it collapsed. The high level of the pot makes me think that it was found in one of the cists and thrown aside as valueless. This is particularly unfortunate, as it is of an unusual type, and one would be glad to know its exact provenance.

We found two large and several small pieces of 104; it has been reconstructed in Belfast Museum, and the drawing also is composite. The texture is hard and slightly gritty, the surface very smooth but quite unpolished; on many pieces it has decayed on the outside. The colour is red outside, grey or blackish inside. The thickness of ·35″ is very constant. The internal diameter of the rim was about 5″, of the neck 4·3″, of the widest part of the body 4·7, of the base 2·95″; the external diameter of the base is 3·4″. The height may be calculated from the slope of the walls, and works out at about 4·7″. The base is flat, the neck bent outwards. The neck and shoulder are decorated with horizontal frames of cord ornament, enclosing an irregular zigzag frieze executed in the same technique. Owing to the deterioration of the surface it is impossible to tell whether there was any ornament lower down; but it certainly did not extend to near the base. The pot is of an unusual type in Ireland. I am inclined to think that it dates very late in the bronze age, and Mr. Hawkes would agree with me; it might however be a degenerate beaker, and consequently earlier than the regular food-vessel.

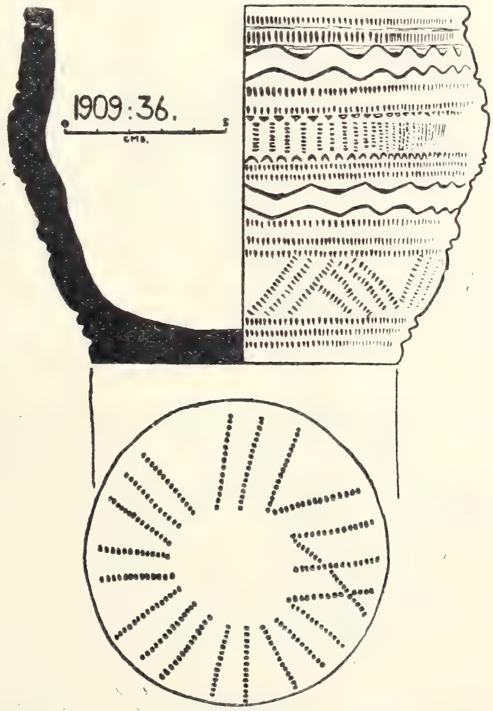
In cist VI were found five pieces of coarse pottery ·35″ thick, one with a slightly splaying rim. They were presumably fragments of a rough, apparently undecorated food-vessel.

1909 35 is the largest food-vessel found; it is complete save for some chips in the rim. The clay is fine, the colour brownish, the pot neatly smoothed and slightly hand-polished. The base rests on a slight ring, and appears to be ornamented with four double quarter-circles set round the circumference. On the rim there are lightly incised two rows of quarter-circle scorings, set in quincunx formation. The body is ornamented much more deeply with horizontal friezes. The shoulder is grooved, and on each side are deep vertical comb-stabs.



DUN RUADH: IN NATIONAL MUSEUM.
Fig. vi.

1909 36 is very nearly complete, though the surface has in parts deteriorated badly, and the pot has split down the centre owing to quick baking. The clay is fine, the surface fairly smooth but unpolished. The pot is a little uneven inside and lop-sided. The base is ornamented with a rayed-sun pattern, the rim with rows of radial dots. On the body are horizontal zones, as shewn on the illustration. The shoulder is very slightly grooved.



DUN RUADH.
Fig. vii.

1909 37 is of coarse clay containing much grit. The colour is reddish outside and brownish inside. The surface is badly weathered. The base is missing, and the rest of the pot is fragmentary. The rim is unornamented. On the body are horizontal zones of hatched lines and triangular stabs, faintly incised. The stabs were executed with a three-sided tool, of which the apex was deeply impressed, but the line of the base can often be seen.

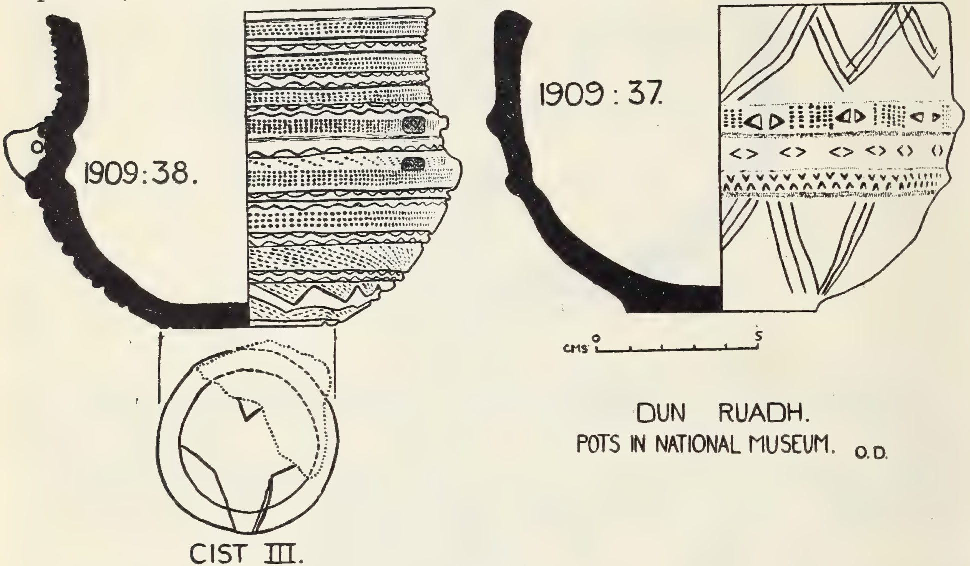


Fig. viii.

1909 38 from cist III has been reconstructed from many fragments; part of the belly and most of the base are missing. It is of fairly fine clay and well baked; the colour is blackish-brown. The body is heavily ornamented; on the rim are two or three concentric circles of dots, on the base a very rough star pattern. The pot had originally five tubular horizontal lugs bridging the groove of the waist; only one survives, one break looks much less fresh than the others, so may have been caused anciently, while at least two seem to have been after the discovery of the pot. These lugs are set irregularly at distances of 8·3, 7·0, 9·8, 6·6, 7·8 cms. Round the top of each the frieze of vertical comb-marks becomes horizontal. Though unperforated lugs or stops are common on food-vessels, both bridging a deeply grooved waist and on other forms, perforated tubular lugs are very rare. In the central cist at Loughloughan (Antrim) was a tall food-vessel with one perforated lug; it was probably of early date, as round the belly was a zone of panel decoration.(28) The cairn of Kilmartin (Argyll) yielded a squat panel-decorated food-vessel with perforated lugs.

The sherds inventoried in Dublin Museum as 1909 39 and 40 belong to the same pot. It is a food-vessel of yellow-brown colour. The surface is smooth and slightly hand-polished, the clay fine with some quartz fragments. The body is ornamented with horizontal zones of impressions of combs and triangles. On the base are rows of parallel comb-marks, which probably formed three or four incised triangles, though only one survives. The rim is grooved in the centre, and along the groove as an axis is decorated with comb-impressions, set in herring-bones fashion, the outer row running clockwise and the inner anticlockwise.

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(28) Buick, J. R., Soc. Antiq. Ireland, xxxii (1902), p. 163.

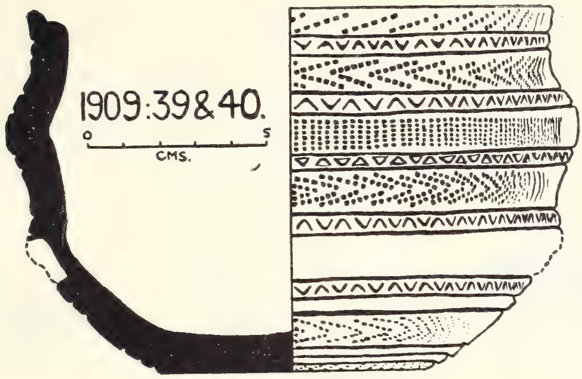

Fig. ix.

In and to both sides of trench LE, between the cairn and the ditch, a rough cobbling of small stones overlay the yellow layer. This had been the floor of a small site, which yielded much charcoal, a piece of flint which seemed to have secondary working along one edge, several scraps of rusted iron, and many sherds of pot M. It is difficult to determine what the iron fragments had been. There was one small lump, several cylindrical pieces about ·55″ across, enclosing a bar of rectangular section ·2″ x ·15″, and one flatter piece ending in a curved point so as to resemble a sheath. A casing tends to form on rusted iron, so the outer layers may be due to natural processes; but the object might have been a fine tool such as pin or tweezers inside an iron sheath.

Apparently not more than one pot is represented. It is coarse and undecorated, hand-made though well smoothed. The thickness is about ·25″, the paste is hard, gritty and well-baked. The colour is reddish or brownish, most pieces are heavily sooted on both sides. No rim was found, but two pieces of ring-base. The number of sherds and the absence of curvature on them shews that it was a wide vessel, probably with nearly vertical walls, and perhaps a large cooking pot. Its shape is more developed than the iron age ware from Potter's Cave at Ballintoy and elsewhere. From its appearance I suspect that it dates fairly late in the medieval period. The site is probably in no way connected with the cairn; it may have been a temporary or semi-permanent habitation.

OTHER FINDS.

Dun Ruadh yielded a considerable number of flints. Though many are flakes or rough chips(29), there were several fine tools. Some were found in the cists, others underlay the cairn.

29 was found 6″ below turf in trench L. It is part of a two-bladed knife, broken at both ends and probably burnt. The lower is a flake-surface, the upper is retouched on both edges.

30 was lying on top of the grey filling of the ditch in trench H. It is a rough reddish flake, 1·9 x 2·0″. The upper sides seem somewhat chipped, and there are perhaps slight traces of retouching along one edge.

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(29) Flakes and chips of flint found in our excavations have been mentioned in the descriptions of the areas where they occurred. In Dublin Museum is one rough chip (1909 48), and four flakes (1909 42, 45, 47, 6b SA 1925) ; the sites of these are unknown.

47 occurred just outside cist I in black earth at the base of the cairn; it may have been thrown out of the cist when it was rifled, as several flints were found inside, and this cist seems to have contained an unusual number. It is a small heart-shaped tool of fairly fine flint, probably a borer. The upper side consists of two flake-surfaces, the lower of one. It is retouched near the point and on the butt, but not at the sides. The length is ·85″, the width ·8″, the maximum thickness ·28″.

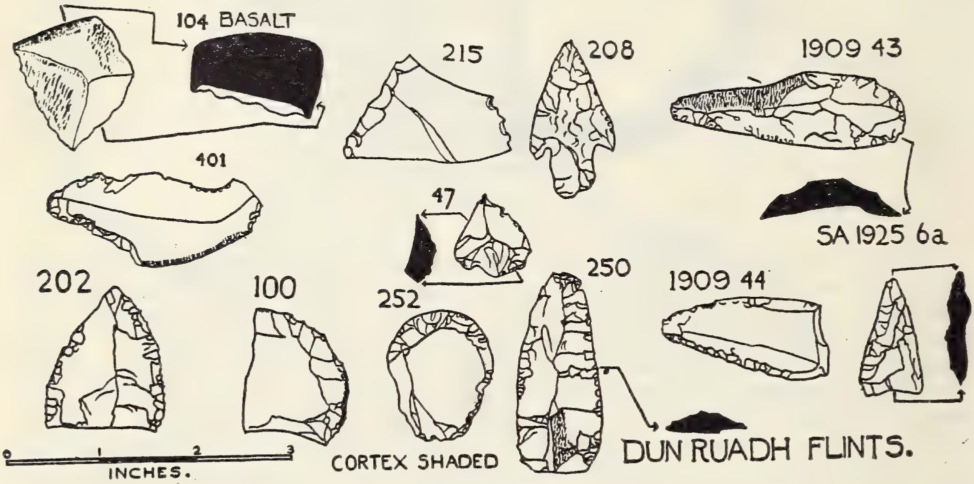

Fig. x.

100 was found on the white layer within the ring. It is a curved end-scraper, probably a little broken, of rather opaque flint, to which a few pieces of cortex still adhere. Both are apparently flake-surfaces, the blade is shaped by flaking to the arc of a circle, and is finely retouched along the edge. The dimensions are 1·3″ x 1·1″ x ·35″ maximum thickness.

113 consists of two flints which rested on the north sidewall of cist I. One is a circular end-scraper, worked round nearly half the circumference. Some cortex has been left on the butt. The underside is a flake-surface with a bulb, the upper similar but shipped off rather squarely to the blade. The length is ·95″, the width ·98″, the maximum thickness ·33″. The other is a squarish chip of dark flint, perhaps roughly fashioned by coarse flaking on both sides, but without fine retouching· The dimensions are 1·0″ x 1·1″ x ·55″ maximum thickness. It does not resemble an ancient tool, but looks more like a gun-flint or strike-a-light, though it is not explained how it came to be found in company with an end-scraper.

115, from cist I, is a small semi-circular scraper. Below is a flake surface with bulb, above two flake-surfaces, chipped away rather squarely near the blade. It measures ·85″ x ·7″ x ·25″ maximum thickness.

200 is a hoard of seven fine flakes, found in brown earth outside the bank in trench NS north.

In trench Y, in grey earth just above the yellow layer, there were two flints, one probably unworked (201). The other is a square piece of poor yellowish material, with cortex at one end. It seems badly burnt, and is perhaps broken. The under side is a flake-surface, the upper probably two, and there are traces of working on one edge. It measures 1·1″ square x ·4″ maximum thickness. From its shape and the high level at which it was found it may be a modern gun-flint.

202. Several flints were found in the habitation layer in trench R. One of them is a triangular two-bladed knife of dark flint. The under side is a flake-surface with bulb partially removed, the upper two flake-surfaces, retouched along both edges and at the point. The butt was squared off. The dimensions are 1·5″ x 1·22″ x ·36″ maximum thickness.

203 is a fine pear-shaped flake, perhaps slightly retouched on one edge. It was found in the filling of the ditch on section NS north.

205, from the surface of the yellow layer in trench A, is a squarish tool of rather opaque flint. The under side is a flake-surface, the upper roughly chipped all over, but there is no fine retouching, so it may have been a spoiled attempt. It measures ·72″ x ·65″ x ·3″ maximum thickness.

Not far from the last, and just above the yellow layer, were two flints (208). One is a barbed and tanged arrowhead of opaque white material, rather roughly chipped on both sides. The tang is slightly asymmetrical. The overall length is 1·6″, that of the tang ·52″, the width ·9″, that of the tang ·43″, the maximum thickness ·27″. The other is an oval scraper with some cortex left on one side. It is of poor flint, so that neither surface has flaked smoothly. One of the longer sides is slightly retouched. It measures 1·9″ x 1·2″ x ·34″ maximum thickness.

215 was found on till below the yellow layer in trench LE. It appears to be the central part of a pointed knife of opaque flint, rather chalky on one surface. It is chipped along both blades. The under side is one flake surface, the upper two.

216, from trench U, is a single-bladed ovoid knife of red-brown flint, with smooth white cortex left on one surface, while the other is roughly chipped. It is retouched down one blade. The dimensions are 1·5″ x ·8″ x ·3″ maximum thickness.

217 was found in a black pocket in the filling of the ditch on section LE. It is an almost triangular scraper of fairly good flint. The upper side is formed of several flakes, the under side is a flake-surface, with bulb at the point; this has been partially removed, but still the point is thick and blunt. The butt is perhaps broken. It is retouched along one side and slightly along the other. The length is 1·4″, the width 1·7″, the maximum thickness ·52″, near the point.

250 comes from the habitation site just outside the ring on section LS. It is a long two-bladed knife of fine flint. The point is rounded, and the bulb, which was apparently here, has been almost removed. The under side is a flake-surface with a little chipping on the blades; on the upper is one flake-surface, the other was cortex, which has been removed save near the butt by lateral chipping. It measures 2·1″ x ·9″ x ·34″ maximum thickness.

Near 250 were two other worked flints (252). One is a pear-shaped end-scraper of opaque flint, chipped all round. The under side is a flake-surface, with traces of bulb at the butt; the upper is formed mainly by one flake. The dimensions are 1·4″ x 1·1″ x ·3″. The other is a flat hollow scraper with the points projecting very slightly. The material is fine and thin, the shape rectangular. The dimensions are 1·2″ x ·8″ x ·24″ maximum thickness; the diameter of the hollow is ·72″, the depth ·06″.

1909 43 is a single-bladed pointed knife of poor flint. The under side is a flake-surface, with the bulb at the wider end. One blade is worked, the other consists partly of cortex· It measures 6·2 x 1·9 cms. x ·8 maximum thickness.

1909 44 is a single-bladed pointed knife of fairly fine flint. The butt may be broken. One blade is retouched, and there is a little very fine work on the other. The under side is a flake-surface, with remains of bulb at the point; the upper consists of three flake surfaces. The dimensions are 4·7 x 2·2 cms. x ·6 maximum thickness.

1909 46 is an ovoid flake, slightly worked at the point and down one blade. A little cortex remains on the surface. It measures 5·2 x 3·8 cms.

SA 1925 6a is a triangular arrowhead with slightly concave base, of bad flint with some cortex. The point and perhaps one barb are slightly broken. The edges are chipped on both sides. The lower side is a flake-surface, with a bulb at the point. It is 3·3 cms. long, 1·6 wide, and ·6 thick.

Dublin Museum contains two rounded white pebbles from Dun Ruadh (1909 49 and 50). We found one in cist I, one in the inhabited pit in trench R. They may have been collected and deposited intentionally.

With pot 104 were two pieces of reddish basalt. The smaller is trapezoidal, 1·1″ each way x ·2″ thick. Three of the sides are slightly polished, two corners are rounded off; the other side and corners are broken. It may have been artificially shaped and smoothed, perhaps it is a broken section of an axe. The other piece is more convincing as a broken square butt; it has remains of three polished surfaces at right angles to each other with rounded edges. It is 2·2″ wide. Basalt naturally occurs in columnar formation, so these pieces may have been picked up and slightly polished and smoothed.

The occurrence of charcoal has been mentioned in connection with the areas described. In addition Mr. M. Y. Orr, of the Royal Botanic Gardens, Edinburgh, reports as follows:—" I note with interest the comparative infrequency of the occurrence of willow-poplar in your collections, since it is much more common in Scottish collections. With you hazel and oak predominate."

The Tumuli.

In addition to the main monument of Dun Ruadh, we examined the two tumuli marked on the map (see special plan). There were visible on the surface a fair number of stones and slight unevennesses in the ground, which led us to suspect that this was an ancient site. This idea was confirmed, and it seems that the tumuli were circular cairns about 20′ across, whence most of the stones had been removed.

In both cases the surface layer consisted of brown earth containing many loose stones. Tumulus II seemed disturbed, as the centre was hollow, and a patch of the white floor was found in the brown earth.(30) Tumulus I had probably been bounded by small upright stones resting on till, one of which was lying flat(31); in II the bounding stones were recumbent and set above the yellow, so that they could with less certainty be determined. The floor of the tumuli consisted of yellow earth with some deep-set stones, covered by a thick layer of white. Mainly at the base of the brown, above the white, though occasionally penetrating into it and into the top of the yellow, was a large quantity of charcoal with reddened pebbles and other signs of burning. In Tumulus II there appeared to be remains of charred planks about 2″ wide. The white layer is clearly here, as in Dun Ruadh, due to the baking of the subsoil. It penetrates in pockets into the yellow.(32) In Tumulus I, I suspect that the yellow layer is a prepared floor, because it becomes mottled immediately outside the western endstone and disappears on the east and south. Further, section TC shews that care was taken to level the site for the tumulus.

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(30) The absence of the white on section TC in Tumulus I is probably due to disturbance. Outside the west edge of Tumulus II was some white, perhaps upcast from inside.

(31) Cp. sections TI, TC. On the south the yellow gave out, but there was no bounding stone.

The purpose of these tumuli is uncertain, as no cist or bones were discovered. The intensity of the fires however suggests that fairly complete cremations may have been practised, so that the bone fragments would have been small; and if, instead of being gathered into a cist, they had been covered by a small cairn, the acidity of the soil might well have caused their complete disappearance. Small circular cairns are fairly common in Ireland, and some of them contain cists.

That the tumuli are prehistoric is shewn by the discovery of two flints lying on the white layer, though there was no pottery. 401, on section TI, is an irregular double-bladed knife of poor quality flint. The under side is a slightly curved flake-surface, the upper two. It is roughly chipped along one blade and part of the other, and worked to a blunt point. A good deal of cortex has not been removed· The dimensions are 2·3″ x ·97″ x .2″ maximum thickness. The other flint (406), from Tumulus I, is a roughly pear-shaped scraper, perhaps slightly broken at the butt. The under side is a flake-surface with bulb, the upper partly flake and partly cortex. On the flake-surface there is some retouching round the end. The dimensions are ·7″ x ·55″ x ·18″ maximum thickness.

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(32) Its slight occurrence beyond the probable west endstone of Tumulus I may be due to spread or disturbance, as it is sandwiched between two brown layers.

EXCAVATION OF THE HORNED CAIRN OF CLADY HALLIDAY.

By O. Davies and C. A. Raleigh Radford.

The horned cairn of Clady Halliday lies on the plateau between R. Derg and Mourne, at a height of rather over 400′, less than a mile north of Ardstraw and about four miles north-west of Newtownstewart (Co. Tyrone).(1) The countryside is mainly cultivated, apart from a few patches of bog, and the drainage is on the whole good, as there is a slight slope to the south, and the sandy yellowish drift covering the schists seems fairly porous. The district is open, intersected by narrow river-valleys, and overlooked by the peaks of Bessy Bell, Mullaghcarn and the Sperrin Mts. Several other megaliths are known within a few miles and in similar surroundings. The monument itself is situated in the corner of three fields, whose walls, as shewn on the plan, follow the western(2) side of the horn and the rear part of the eastern peristalith. It is said that many stones were removed about thirty years ago, apparently mainly from the western peristalith and the west side-walls of Chambers II and III.(3)

The cairn lies on the farm of Mr. A. Bell, who most generously granted permission to excavate; thanks are also due to Capt. Ross and to Mr. Henderson for making all arrangements. The excavation was carried out from March 25 to April 5, 1935, under a grant from the Archaeological Section of the B.N.H.P.S. The working party consisted of the authors, Mrs. Anderson, Miss Gaffikin, Mr. B. Megaw, Mr. E. E. Evans and Mr. I. J. Herring; one labourer was employed. So far as possible, the structural features of the cairn have been left visible, but we were unable to exterminate the bracken which covers it in the height of summer.

Trenches were dug in the forecourt and in the eastern and southern parts of the cairn between the chambers and peristalith. On the western side Mr. Bell objected to excavation in the field. The chambers were mostly cleared, small areas being left untouched in the north-east corner of Chamber I, the south-east corner of Chamber III, and the north part of Chamber II under the fallen roof-stone, as indicated on the plan. Finds have been deposited in the Belfast Museum.

The Structure.

The first stage in the construction of the monument was to turf and clean the area. Fragments of oak charcoal (16) were found on virgin soil beneath the floor behind the end-stone, and of oak and hazel (53) in Chamber I with old root-channels, but otherwise the till was clean. The builders then set up the uprights of the horn, chambers and peristalith, laid down the floor, and finally piled up the cairn and roofed the chambers.

The farmers say that the stone used does not occur in the immediate vicinity. The majority of the uprights, corbel-stones and peristalith-stones (save especially E4 and E5), and many of the surviving cairn-stones have fairly flat surfaces

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INTRODUCTORY NOTE. Reference numbers in brackets without further explanation indicate the find-inventory numbers, as detailed in the catalogue and marked in the find-boxes.

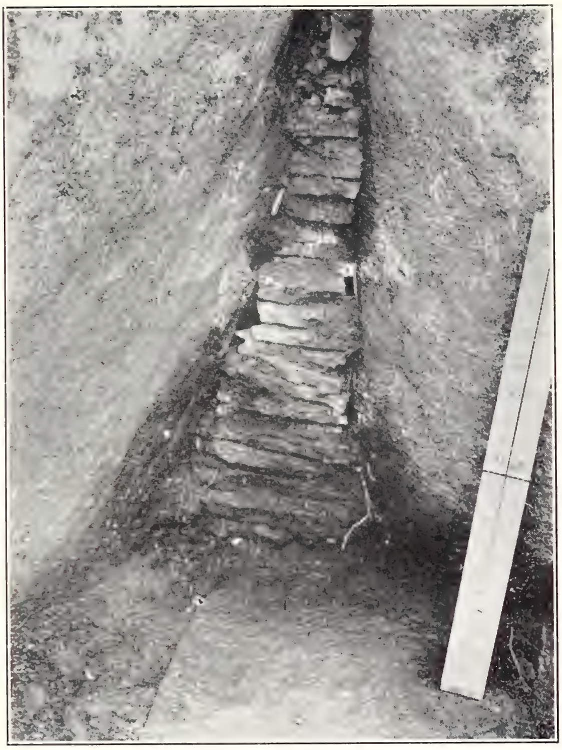
(1) It is marked on O.S. 6″ Sheet 17 (Tyrone), in the north-west corner of the sheet, under the name Carnmore.

(2) The orientation of the cairn (section-line A) is 79° magnetic, but for convenience the north-western side is referred to as the western, etc.

(3) At the base of the pit of the north-west orthostat of Chamber III was a piece of modern glazed pottery, so this stone must have been removed when the monument was last robbed, within living memory.

DUN RUADH SECTIONS

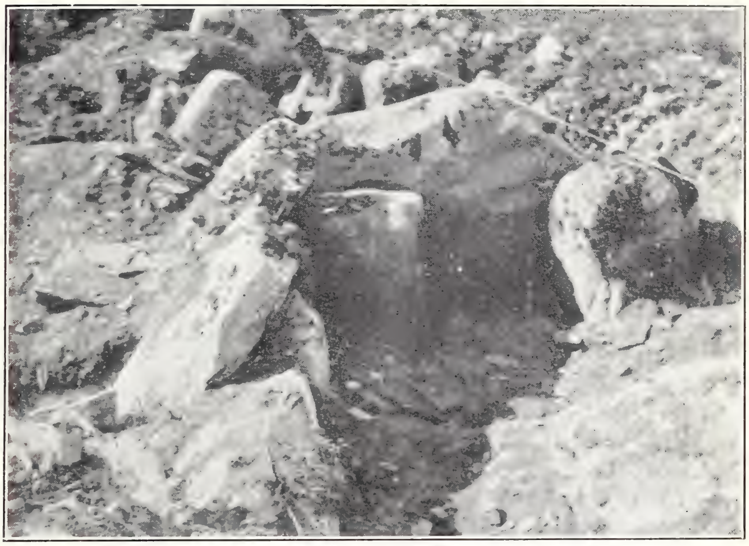
CLADY HALLIDAY HORNED CAIRN SECTIONS



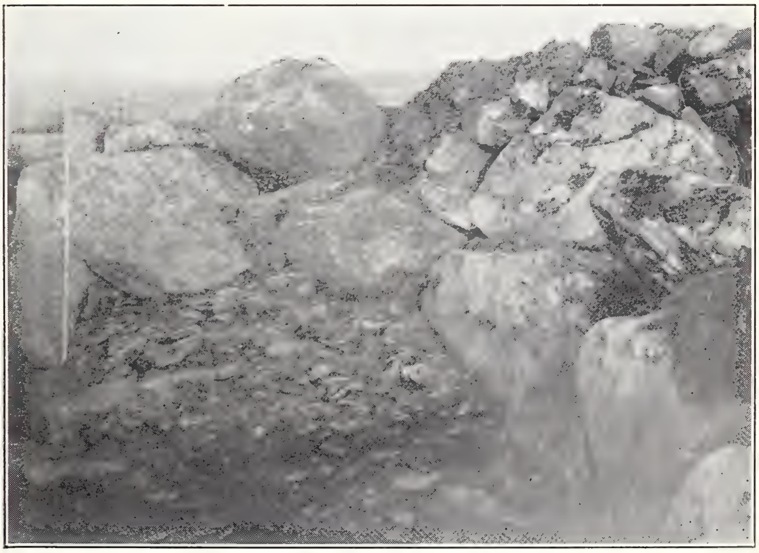
Clady Halliday—Dry Walling betwzen W 2 and W. 3.

Dun Ruath.

BRITISH MUSEUM
NATURAL HISTORY



Clady Halliday—Chamber I looking south from portal.



Clady Halliday—N. E. corner of Chamber I.

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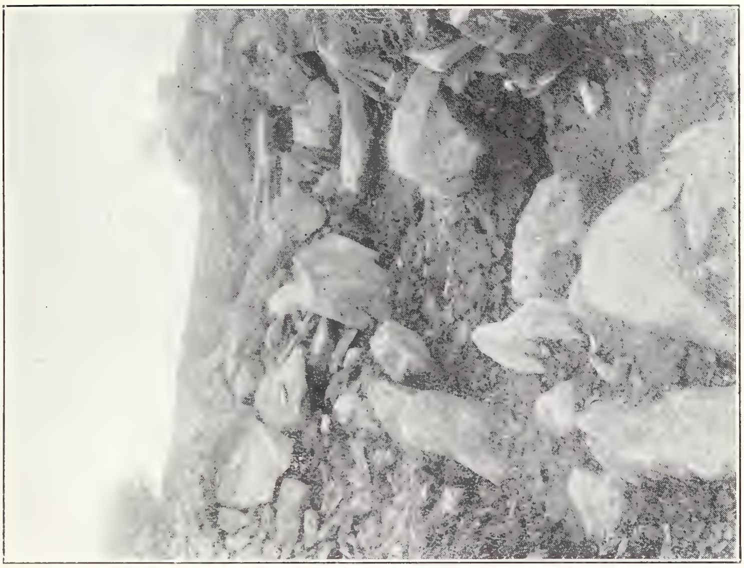
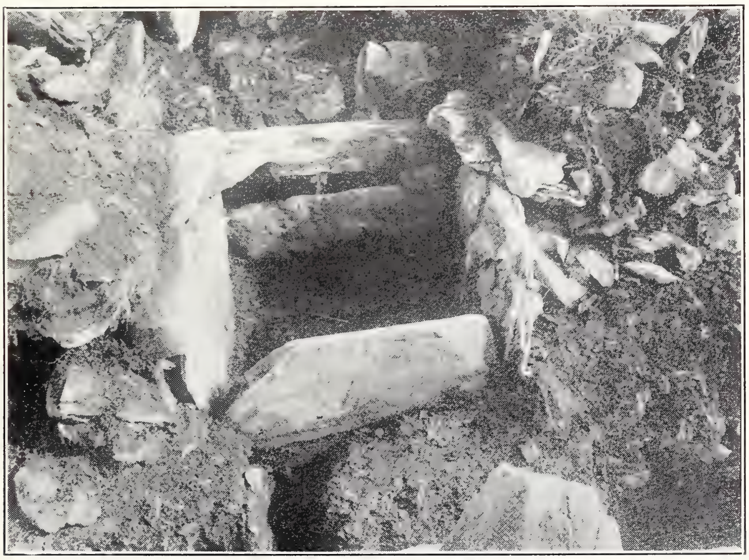


Dun Raudh—Peristalith.



Dun Ruadh—Cist I from W

BRITISH MUSEUM
NATURAL HISTORY

but rounded edges (cp. 141), and are declared by Mr. J. J. Hartley to be schistose grit, which occurs in the district, especially in Co. Donegal. They seem to have been obtained from the moraines, which extend north-westward from Newtownstewart along the south bank of the R. Mourne, the nearest point being about a mile from the cairn down a rather steep hill; similar stones are now visible there. They may have been slightly smoothed on the flat surfaces, and were sometimes shaped, such as the shoulders on W1 and E1, to receive the corbels (see below and section F). There were not however enough suitable stones available in the moraines, so some of the horn-stones and the large roof-stone in Chamber I, which would have hardly shewn when in position, are of coarse unrolled grit with quartz veins, which was probably quarried.

The horn- and peristalith-stones, which held back the weight of the cairn, were bedded deeply into till, so that the pits survive where the stones have been removed (sections B, F, G). As they supported no roof, they did not need to be of even height, though on the whole the taller horn-stones were near the portals, where the cairn behind was wider and probably higher. The outer horn-stones (e.g. E5) were also not sunk so deeply into till, and were not tightly packed on the inside as was W3 (cp. section B). Trenches on the outer faces of E3, E4 and E6 shewed that these were supported by small wedge-stones rammed into till (see plan) and resting against the yellow floor; there is usually a little black earth, probably due to roots, between the horn- and wedge-stones. The pit with packed stones on the inner face of W3 shews that the horn-stones were dug in from this side (section B).

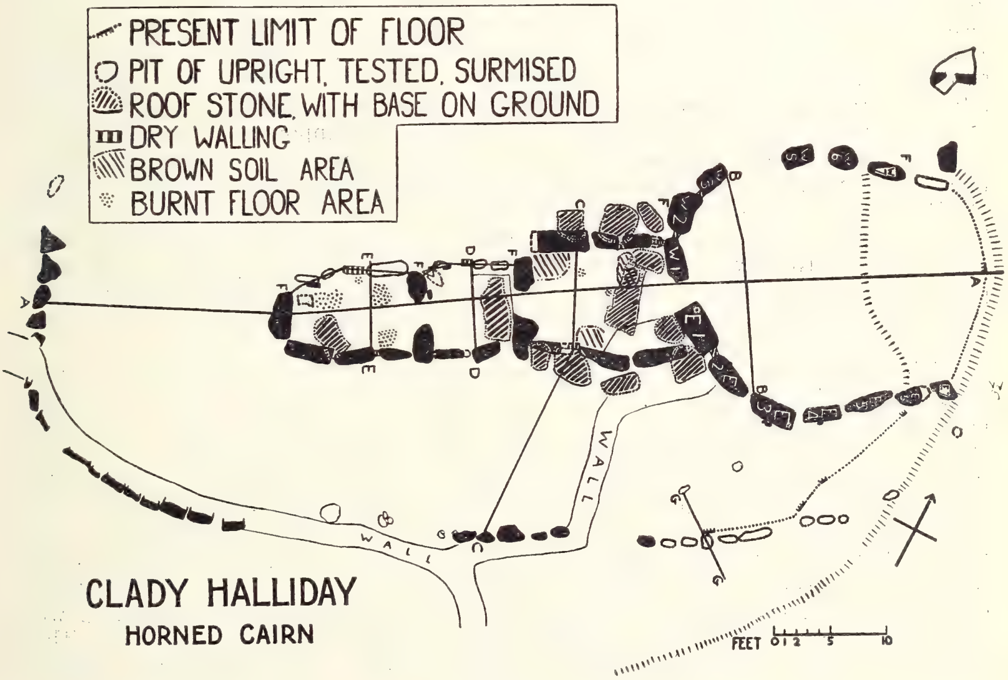


Fig. 1.

Apart from the portal-stones W1 and E1, there are six horn-stones on the east side and five on the west (sections A, F). E6 does not seem in position and may have tilted slightly. The pit of another horn-stone W8 was discovered, and the gap between W3 and W5 makes it certain that one existed here, though it could not be tested without taking down the modern wall. The horn is thus horseshoe-shaped instead of semi-circular. Dry walling, consisting, as always here, of thin slabs laid horizontally and shaped to fit the gap they were to fill, was found in the interstices between the bases of W1 and W2, W2 and W3, E1 and E2 (sections A, B, F).

Each chamber has three side-stones, save for the east side of Chamber II, which has two. Stones of convenient length were chosen. Their tops had to be fairly level to support the corbels, nor could wide gaps be left between stone and stone; but as some were triangular rather than square, the interstices at their bases were filled with dry walling resembling that in the forecourt (cp. plan, sections A, D, F, and especially ths small spaced pits on the west of Chambers II and III). This walling was constructed after the floor was laid down, though the latter is later than the uprights; but it seems to have been slightly scraped to receive the wall-stones (cp. the thin floor under the walling in Chamber II, and the prepared bed for walling next to the end-stone in Chamber III, section F).

The weight of superposed cairn would steady the side-stones so that they need not be sunk into till. But they had to be level to take the roof, and it was easier to dig them in than to pare them down. This was especially the case with the jamb-stones, which supported lintels directly and without the mediation of corbels of selected thickness, so their tops were always level (cp. section A, where the two jambs of each portal are juxtaposed; and the depth to which the west jamb of Portal II is sunk, as compared with Portals I and III). The side-stones were sunk 3-9″ into till as required (sections C, D, E, F).(4) It was not considered advisable to probe beneath them, in order to see whether they were built up on dry walling as at Ballyalton.(5) They were supported by wedge-stones rammed into till, which were most clearly visible round the pits whence uprights had been removed (some have been shewn on the plan, cp. also sections A, C, D, E, F); in section C, where the pit was much too wide, it was packed with boulders and the floor was laid above them, so that the lower part is soilless. The same method was probably adopted on the outside, but was not here proved save at the pits on the west of Chambers II and III and behind the end-stone (section A). Usually a thin layer of brown earth separates the wedge-stones from the clean till.

The south-west corner of Chamber II was felt to be weak, and so was strengthened by a buttress-stone 1′ 6″ high. This had rested on a prepared bed on the floor, like the dry walling, but had collapsed (cp. plan, where it is shewn as found, and section F, as replaced). A large stone in the south-west corner of Chamber III may have served a similar purpose (see plan). The greater width of Chamber I made it necessary to pack the corners more carefully. In the south-east corner was a fairly deep structure 1′ 6″ square of flat stones wedged together, overlying brown earth which was dark on top probably owing to the infiltration of silt. This underlay the floor, which as about 1″ thick and composed of alternate layers of red and light yellow clay (139); above this was the brown top of the floor and the upper paving (see below), while a thin slab wedged the crack between jamb and side-stone. The corners were further secured after the upper paving was laid down, at the time of the closing of the monument. The two south ones were sealed with wedged stones and hard rammed clay, like that from the main portal (see below). In the north-west the hard sealing of the entrance extends into the corner; above it, corresponding to the loose packing in the centre of the chamber (see below), is a pile of stones and yellow clay, sloping steeply outwards from a point in the corner 2′ 4″ below the top of W1 (cp. section A, the line with dash and two dots).

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(4) The south-east side-stone of Chamber II seems to have been broken recently.

(5) B.N.H.P.S. Proceedings, 1933/34.

The jamb-stones and end-stone are squarer and more massive than those used for the sides. This feature has been noticed on other horned cairns, and was particularly necessary at Clady Halliday, owing to the absence of sills to hold the jambs apart, which are common in monuments of this class (cp. Goward, Ballyalton, Browndod). It is difficult to say at present whether the use of sills indicates a chronological or a local distinction; Ballyalton was a late member of the series, and the plan and pottery of Clady Halliday look fairly primitive. Where possible, the side-slabs were slighly keyed behind the jambs, but the plan shews that the latter do not support the monument as at Goward.

It is noteworthy that Chamber I is much wider than the other two. It is difficult to see why the east side-wall slopes inward instead of occupying its natural position behind the jamb of Portal II, unless the available roofing-stones were not long enough. The wide pit in till on section C shews that there was readjustment in the construction. At Goward also the first chamber was wider than the others, while the evidence produced by Mr. E. E. Evans at Dunloy confirms what is suggested here, that Chambers II and III are late typological developments in the horned cairn series.

The shape of the peristalith is roughly oval with flattened ends.⁽⁶⁾ The south-east corner is fairly sharp, the north-east probably so; on the north-west the first stone survives, and a small trench beyond, marked on the plan, was outside the monument and revealed only slipped cairn-stones. Thus the length of the southern faces outside each horn was less than 7′, and from the trend of the eastern side probably 5-6′.⁽⁷⁾ On the east the pits of the stones were traced up to the field-wall. The stones themselves then survive on its inner face opposite Chamber II, and on its outer face in the rear of the monument; opposite Chamber III they must be incorporated in the modern wall, and the cairn-stones shewn on the plan are in situ. The peristalith-stones are set contiguously, and would have stood about 3′ above the ground (sections A, C).

The cairn has almost entirely disappeared. It consisted of large wedged and bedded stones without soil (section A, C), and rose to at least 6′ above the floor (top of W2 and E2, and recontructed height of roof-stone superposed on corbel and side-stone), probably considerably higher. In the upper part of it, somewhere above Portal II, there was perhaps a cist with secondary burial (see below).

After the uprights were in position, the area was covered with a floor of clean yellow loam (135), 1-3″ thick, occasionally containing charcoal fragments (e.g. 15, oak, behind end-stone). It abuts against the inner face of the peristalith (sections C, G) and against the uprights (sections A, C, D, E, F), overlying the wedge-stones but underlying the dry walling. In the north-east corner it does not extend as far as the line of the peristalith (see plan), but has probably been eroded by agricultural operations. In the southern part of section A it disappears suddenly about 3′ behind the end-stone, but probably reappears discoloured as the brown earth near the peristalith and in a pocket half-way along, and elsewhere has been eroded.

In the chambers the floor overlay a lower paving normally composed of unrolled massive quartzite pebbles about 3″ long (131), which were rammed into

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(6) The west side could not be traced as we were not allowed to dig in the field; but its general line can be reconstructed from the east side.

(7) The bank on the north and north-east (see plan and section A) seems to bear no relation to the monument, and is probably due to modern ploughing.

till (sections C, D, E). The surface of the floor was always discoloured brown and below often grey, and yielded pottery and charcoal.⁽⁸⁾ It was covered by a thin layer of black peaty material containing charcoal at the south end of Chamber III, patchily in Chamber II (147), in Chamber I (149), and parts of the forecourt (cp. sections A, B, C, where it is shewn by a thicker line at the top of the floor); the material resembles the sealing of Portal I. The whole was covered by the upper paving, probably when the monument was closed. There are also several small burnt patches on the floor (see plan, sections A, C, E), both in Chamber III (136, near 113⁽⁹⁾, and the cremation area 137-140, see below) and in Chamber I (138, 148), where the burning overlay the lower pavement in the lowest part of the floor, and a layer of clean loam seemed to have been placed above it.⁽¹⁰⁾

Clady Halliday is unusual in providing considerable evidence as to the method of roofing the chambers, as, apart from an old drawing of Annacloghmullin (Co. Armagh)⁽¹¹⁾, our information on this subject is mainly derived from outside Ireland. It appears that the portals were spanned by lintels, while the greater width of the chambers necessitated the use of corbels resting on the side-walls and counterweighted by the cairn, between which were laid long blocks of stone. The stone found in the north-west corner of Chamber I may have formed the lintel of Portal I (see plan, dotted in in section B); it is an elegant stone, flattened underneath, and with nicely rounded corners and upper side. The stone in Chamber II may have been the lintel of Portal II (see plan): it has been chipped to a hollow underneath on the west side, so that it could rest on the point of the west portal. In Chamber I three corbel-stones have slipped backwards on the west side and four on the east, while one in the chamber has probably fallen from the gap on the north of the centre (see plan, sections A, C, F). The jambs of Portal I are notched to receive corbel-stones, E1 1′ 5″ back from the inner corner and W1 2′ 10″ back (cp. section F), giving a span of 7′ 3″, which could be covered by a roofing-block of less than 8′. On section C, allowing 1′ 6″ overlap for counterweighting on each side, the span need not have been more than 5′. The large block in the centre of the chamber (see plan, section A) was probably a roofing-stone. It is now 5½′ long, but has been broken at the west end. Its smooth face is to the north, and thence it rises at an acute angle, having probably fitted to its neighbour on the principle of the key-stone of an arch, in order to concentrate the strain on the firmest parts of the corbelling, while the north face was originally underneath. It is doubtful if the underside of the roof would have been flat, considering the varying height of the uprights and thickness of the corbels; but section C shews that the upper surfaces of a pair of the latter were within 1″ of being level. The height of the portals and of the chamber from the floor in the centre was about 3½′.

The corbel-stones of the other chambers are no longer in situ. One is probably lying in the south-eastern part of Chamber III, one on the cairn to

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(8) Brown from Chamber I 132, from Chamber III 137. Grey from forecourt 134, from Chamber I 133, containing many small stones; grey also in Chamber II. Mr. Common says that the grey is probably the yellow leached. Below the floor in the forecourt and in Chamber II is a yellow-white layer 2″ thick, which may be the leached till.

(9) Here (sections A, E) was a ring of stones set into the floor, about 18″ across and bounding a cup-shaped hollow in the floor 1-2″ deep, which must have been prepared when the chamber was constructed, as the lower pavement sinks slightly below it. Inside it were traces of burning, reddened sand and schist, charcoal, etc. Much of the pottery from Chamber III has been burnt, see below.

(10) Another patch beneath the north end of the fallen roof-stone in Chamber I was burnt on the present surface of the floor.

(11) Archaeologia, XV p. 408.

the east of Chamber II, two on the west of Chamber I; a third stone here probably comes from the western peristalith.

The purpose of the monument was funerary. An incomplete cremation of an adult human was discovered on the east side of Chamber III(12) (137, 140, section E). The majority of the bones lay on the stained yellow floor, but a few were rather higher, in brown soil containing very little charcoal among the upper paving. Professor Walmesley is of opinion that the cremation has been disturbed, and this is borne out by the fact that though the floor was partially blackened round it, there were no signs of intense heat. It thus seems certain that the incineration took place outside, and that the ashes were thrown in hot. The other lightly burnt areas in Chamber III are almost certainly connected. In them were found nearly all the fragments of pot B (see below), which was proved to have passed through the fire by its mottled surface and especially by a red and a black piece joining. Further, the small number of fragments of this pot found suggests that the whole of it was never inside the chamber, as the greater part can hardly have escaped when the west side-wall was recently removed, and is unlikely to lie buried in the still unexcavated corner.

When the monument went out of use, the floor of the chambers was covered by a fairly close-set paving (sections A, C, D, E; less contiguous in Chamber II than elsewhere). It was impossible to determine whether soil was thrown in at the same time, save that in Chamber III the earth became grittier near the stones, of black colour and containing much oak charcoal (116) under them, brown around and above them. Discontinuous flat stones in the outer part of the forecourt may have formed part of this paving.

Chambers II and III do not seem to have been further filled. The fairly compact dark gravelly earth in them looks like field-soil which has accumulated since the removal of the west side-wall. It contained some uninteresting flints, one burnt, a tooth of sheep or goat, and minute and undatable pottery fragments (105, 107), while at its base were several scraps from the second cremation (see below). A large stone in Portal III may have been intended to block it, as was done in Portal II. The north end of Chamber II, on the other hand, contained a packing of quarried stones without soil, like Chamber I, but its junction with the field-earth could not be determined owing to the fallen lintel.

The southern part of the forecourt and the northern half of Chamber I were sealed by wedged stones cemented by very hard black or sometimes yellow material, which Mr. R. H. Common reports is not natural but a puddled mass of partially burnt earth containing charcoal and ash (142, 143, 145, 146, sections A, B). The lower stones are roughly horizontal with vertical wedge-blocks, and probably represent the continuation of the upper pavement; the higher are bedded at about 30° facing northwards. Inside the chamber the black material is somewhat disintegrated, and mainly survives adhering to the stones. It does not extend quite as far as section C in Chamber I, while in the forecourt its limit is irregular, as it is found up to 8′ from the portal on section A, but its presence was not certain on all parts of section B. The maximum height of the black material is less than 1′, but stones bedded in it rise several inches higher. It yielded no finds except the arrowhead (24), but the perforated stone (4) lay on it at the base of W1.

Portal II and the south corners of Chamber I seem to have been closed similarly. In the lower part were horizontal slabs set in brown clay, of uneven surface and less hard than in Portal I, perhaps because it could not be properly rammed in the confined space; above these were several massive boulders set loosely in earth and probably corresponding to the filling of Chamber I to be described below. There were similarly several large boulders at a high level in Portal I.(13)

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(12) Professor T. Walmesley, who has most kindly examined the bones, reports that the fragments are very small, and the inner surfaces of some are still charred, so the incineration has not been complete. A few phalanges of the foot and ribs can be recognised as human. In the earth sample the pieces are mixed together at all angles, so the incineration has probably been disturbed.

Approximately on the surface of the brown sealing in the south-west corner of Chamber I were found many minute pieces of burnt bone (36, 38, 39, 42, 49, 52) with some charcoal and fragments of pot E. (42) was recognised by Prof. Walmesley as adult male human from the temporal region, (39) as humerus, (52) is also human. Other pieces of similar bone, human if recognisable at all, were found in Chamber I in the packing (33 human skull, 44), at the base of it (34 human skull), and close to the turf (30 human skull, 45 with part of pot E), and also in Chambers II and III, just above the upper paving (83 human, 87, 101 human skull, 108, 109, 110), and at a high level (84 and 85 human, 111). These bones are certainly unconnected with the cremation 137-140 in Chamber III, as they are much better burnt, and it was sealed in such a way that it could not be disturbed. Their distribution is thickest round the west jamb of Portal II, whence came all the fragments of Pot E, unless one may connect with it the scraps (107) from Chamber III and some fragments from Chamber II (81, 82, 86). It is difficult therefore to resist the conclusion that there was a secondary cremation in the upper part of the cairn; the bone-fragments found their way down, perhaps when the cairn began to be disturbed by stone-seekers, mostly to a solid level, the sealing of Chamber I of the upper pavement of Chamber III, though a certain number did not fall so far. This interment was probably accompanied by pot E, which appears to be of early type, while its shattered condition may be accounted for by the treatment which it has received.

The filling of the upper part of Chamber I consists of numerous flat quarried stones, up to 1′ across and set in no order. In the lower levels there is no soil apart from occasional clay pockets, as round pot A (32), while the surface layer is mixed with black rather gritty earth, underneath which in places is a thin layer of brown (see plan, sections A, C). It seems difficult to explain the presence of these stones by any natural or casual cause, as they are unlike the large rounded boulders used for the cairn; so it is probable that they were piled in as loose packing when the monument was abandoned, in order to close it completely, though the low roof prevented them being properly built or set. This packing turns up also just beyond Portal II. It yielded from Portal I the flints 21, 22, 23, a quartz crystal 26, the reconstructed bowl A (32), and two teeth of sheep or goat (48). It is porous, and modern glass was found as far down as the upper pavement. The black earth is probably naturally deposited; it is noteworthy that it is much thinner under the fallen roof-stone where the filling was protected from wind and rain (section A). The meaning of the brown soil is uncertain.

Above the floor and sealing of the forecourt was a layer about 1″ thick of dark soil with many small stones and occasional yellow pockets, turfed on top and containing fragments of hazel and gorse (see below) charcoal. It yielded two worked flints (2, 3), pot F which appears ancient (see below), a tooth of an ox, and a rolled white stone which may have been transported. The slight but rather sharp rise in the outer part of the forecourt (hardly visible on section A, but marked near each horn) may indicate recent disturbance, as in the higher part were a number of stones which had probably slipped inwards from the cairn;

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(13) Above the highest boulder and just beside the north face of W1 was found a piece of brittle black material. Miss Lynn and Mr. Common say that it is not charred peat, but it is organic, with a whitish ash with red stains, weighing 5.4% of the total weight. Its nature is uncertain.

this is borne out by the discontinuity of the pavement, if it be one, and of the floor in the outer part of section A. The pit on section A in the middle of the forecourt, filled with stiff grey sand and apparently overlying the floor, is unexplained, but may be parallel to the disturbance due to the setting up of the pointer stone in the centre of the forecourt at Browndod.

THE FINDS.

Pieces of five pots could be distinguished, and a number of flints were found (see fig. 2).

Pot A, 32, from filling of Portal I, see section A; about 40 fragments, which make up a nearly complete pot. The colour is dull red, with black and yellowish stains. The surface is rough inside, outside moderately smoothed but unpolished, with some irregular shallow striations forming no pattern and looking like marks of grass-stalks which had touched the clay when soft. The biscuit is black and inclined to split longitudinally, showing that the firing was too quick, ·2-·4″ thick. The base is round. The rim is simple and rounded, in places slightly folded over by smoothing, plain on the outside but projecting a little on the inside. The shape is clearly neolithic.

Pot B, 106, 104, from the burnt areas on the yellow floor of Chamber III (118, though of rather greyer surface, and 113 without surface from the same level probably belong; 112, found in the dark earth containing much charcoal

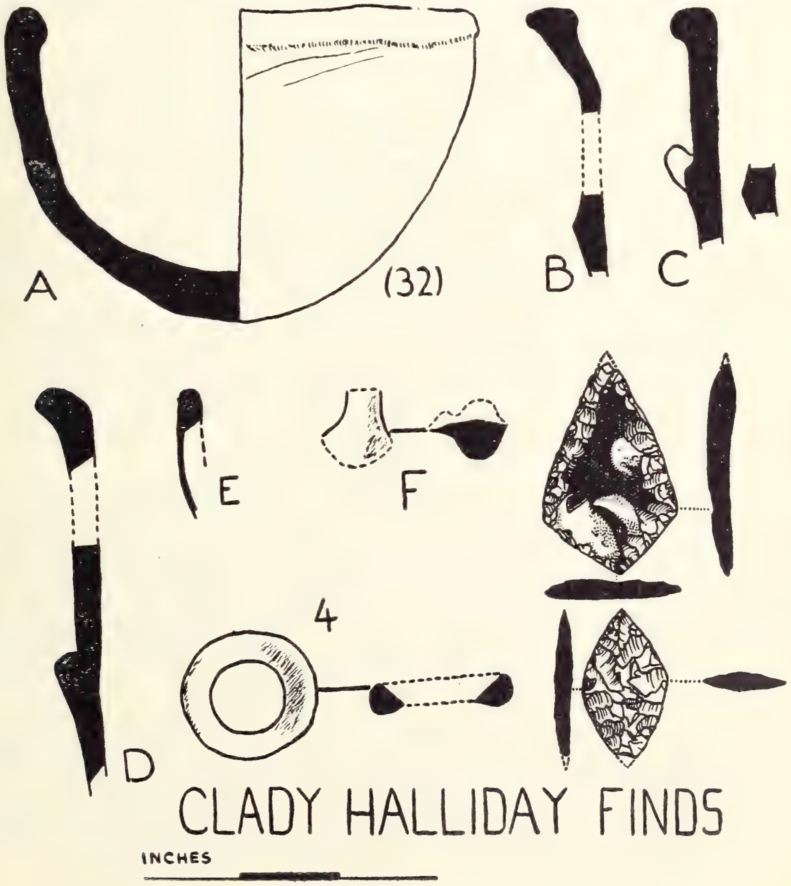

Fig. 2.

just below the upper pavement, may also be connected); see sections A, E. The biscuit is reddish-grey, rather flaky, with some grit. The surface is moderately smoothed but unpolished; the texture resembles that of pots C and D, from Chamber I, but there are no certain joins. The colour was originally red, but has become mottled owing to passing through the fire. The shape seems to have been a wide bowl with rim bent slightly outwards, of at least 7″ internal diameter. There is no base. The rim is plain, with a slight splay inside and occasionally outside; the surface is not quite level all round. The thickness is ·2″ at the neck, ·3″ at the shoulder and body, ·4″ at the rim. Though there are no parallels to this splaying rim from Ireland, the type of angular shoulder in this pot as in C and D is clearly allied to that of the neolithic wares from near the coast.

Pot C, 28, 40, 46, 51, 80, probably also 27 and 50, from floor round Portal II, see section A; many disconnected fragments. The biscuit is brown and flaky, the surface red-brown and on the outside occasionally reddish, slightly smoothed and unpolished; the thickness is ·3″. The pot seems to have been a small bowl, of not more than 6″ internal diameter. There is no base. The rim splays out to a thickness of ·5″, and is nearly flat on top. The height of the neck is 1·3″. The shoulder is angular, but rather smoothed off; from it project upturned lugs, of which four were found. Two angular fragments (drawn at the side) do not seem to fit the shoulder-profile, but being slightly curved on both faces they can hardly be base.

Pot D, 55, from yellow floor of Chamber I. The biscuit is reddish and flaky, the internal surface red and very crumbly, the external sometimes brown-black. The surface is unpolished though fairly well smoothed. The thickness of the body is approximately ·3″. The shape resembles that of funerary pottery on the coast, but the technique is much poorer. The bowl is too rough to estimate the diameter, but it must have been nearly 1′. The rim splays to a thickness of ·5″, and is lightly rolled over. The shoulder is very angular, the neck almost straight; they are in one piece, and the junction is so sharp that it may have been made by compression with a strap; on the few extant pieces there is no sign that the finger was run round.

Pot E, many small fragments of curved pot (hence not of great diameter), 36, 43, 45, 47, 49, perhaps 35, 37, 41, 81, 82, 86, 105, 107, from high level mainly round Portal II, see sections A, C; some pieces were found with bone fragments from the second cremation, see above. The surface is red to brown, moderately smoothed. The rim is ·25″ thick, apparently plain, and probably of early date. Nearly every piece is split longitudinally.

Pot F, 1, from high level in forecourt, in the area where there may have been recent disturbance (see above), see section A; several crumbly fragments, very lightly baked. The biscuit and surface, where original, are light grey. The shape of the main fragment cannot belong to any type of pot, but is a semi-cylinder 1″ long and ·5-·8″ in diameter, flattening out into wings at one end. The object must almost certainly be regarded as a portion of a clay spoon, such as have occasionally been found with neolithic associations in England, and have been classed by Piggott with the Windmill Hill culture.(14) It is presumably of the type with bowl in line with the handle.

The stone finds include three quartz crystals from Chamber I (25, 26, 29), a perforated disc, and a number of flints. Of the last, flakes and chips have been mentioned in the text. The forecourt also yielded at a high level a broken fragment ¾″ x ¾″ with some chipping along one edge, perhaps a piece of a scraper (2). At the base of the yellow clay sealing in the north-west corner of Chamber I was a rolled flint, yellow-brown in colour, which seems to have been broken in half, and then some flakes were taken off the cortex; it may be a rough core.

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(14) Archaeological Journal, lxxxviii (1931) p. 77.

From the packing material in Portal I came two flint knives (21, 23) (see section A). The former, 2·4″ long x ·4″ wide at the butt and ·8″ at its greatest width one third of the way from the base x ·2″ maximum thickness, is of poor flint, a little cortex being left on the blade. The point is blunt, the blades approach it rather unevenly. On the underside is a flake-surface, on the upper two. The other knife is also of bad white flint; its length is 3·2″, maximum width half-way up ·8″, maximum thickness ·35″. The under side is a flake-surface, the upper two, one of them rough and uneven. The shape is a segment of a circle, the point is fairly sharp, the butt apparently slightly broken. There has been retouching on the straight edge from 2″ from the point, mainly on the under side; and on the curved edge from 2·3″ from the point, only on the upper side.

No. 22, from the packing in Portal I (see section A), is a lozenge-shaped javelin, not quite symmetrical lengthways, 2·8″ long x 1·35″ wide x ·25″ thick at the bulb (just under the point) and about ·18″ at the other end. The point is probably slightly broken. The under side is a flake surface, the upper has probably two main ones; on both sides it is retouched all round the edge. Both surfaces were roughly polished before retouching (the polished areas are shown in black on the illustration).

No. 24, from the sealing material in Portal I, is a leaf-shaped arrowhead of poor flint, slightly broken at the butt, while the point is sharp. The length is now 1·5″, the width ·85″, the maximum thickness ·18″. Both faces have been chipped, but the flakes have not come off well.

No. 4, from above the sealing just outside W1, is a perforated disc of schist, nearly circular, of outer diameter 1·4″ x 1·3″, and ·25″ thick The perforation is quite circular, ·75″ across, and so must have been made by grinding at an angle of about 45° to the upper face of the stone.

The charcoal specimens have been most kindly examined by Mr. M. Y. Orr, of the Royal Botanic Gardens, Edinburgh. They include oak, hazel, pine and gorse. Mr. Orr comments on the last, that it may be accidental and have been burnt in situ; it was found in pockets above the loose cairn material just inside E5, which seemed due to modern fires; so it is probably not contemporary with the monument. Specimens of the other trees occurred in key positions, on the floor or at least below the upper pavement. Pine is unusual, and has not been previously identified from neolithic deposits in Ulster; but Mr. Orr draws my attention to Henry's article(15), which states that it has been found in association with early remains in Ireland, not exactly dated, and that it is commonly mentioned in the Brehon Laws. It seems to have disappeared during Christian times.

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(15) County Louth Archaeological Journal, iii (1912/5) p. 237.

THE ACCOUNT OF BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY FOR THE YEAR ENDED 31st OCTOBER, 1936.

RECEIPTS.		
To Subscriptions		£88 0 0
,, Dividends		13 16 9
,, Rents		223 8 9
,, Rebate of Income Tax		8 2 0
,, Miscellaneous Receipts :—		
Archaeological	£19 2 2	
Proceedings and Periodicals	1 8 7	
		20 10 9
,, Balance against Account on 31st October, 1936		99 10 2
		£453 8 5

PAYMENTS.		
By Balance as per last Account		£145 18 8
,, Rent, Rates and Taxes		27 13 2
,, Printing and Stationery		92 9 3
,, Salaries and Wages		53 1 2
,, Advertising		4 11 0
,, Fuel and Light		30 15 3
,, Other Payments :—		
Archaeological	£22 2 10	
Lectures	11 5 0	
Postages	10 4 3	
Nendrum	6 7 10	
		49 19 11
Sundry Accounts	£33 7 1	
Subscriptions	3 0 0	
Bank Charges and Interest	6 14 5	
Audit Fee	1 1 0	
Lanterns	4 17 6	
		49 0 0
		£453 8 5

Securities—£400 York Street Flax Spinning Co., Ltd., 4½% Debentures.

We certify that the above is a true Account.

E. J. ELLIOTT, Governor.
W. B. BURROWES, Accounting Officer.

31st day of October, 1936.

I certify that the foregoing Account is correct.

C. H. MACONKEY, Comptroller and Auditor-General.

9th day of December, 1936.

The Account of The Belfast Natural History and Philosophical Society given on preceding page is in the form prescribed by the Local Government Board. It includes the subscriptions and expenses of the Archaeological Section, separate account for which is as follows :—

ARCHAEOLOGICAL SECTION.

1935.						1935.				
Nov. 25	Balance	£110	10	8		Nov. 29	Expenses, O. Davies	£4	4	0
,, ,,	Subscriptions	15	7	2		1936.				
,, ,,	Do.	3	15	0		Apr. 25	Do. Do.	1	0	0
,, ,,	Subsidy	8	12	6		,, ,,	Northern Whig, Ltd.	5	8	0
,, ,,	Do.	0	5	0		,, ,,	Lectures, Prof. Sinclair and K. Povey	3	0	0
1936.						June 3	Northern Whig, Ltd.	0	19	0
,, 1	Balance	117	1	1		,, ,,	News-Letter, Ltd	0	9	9
						,, ,,	P. O'Kane, per Miss Gaffikin	4	17	6
						,, ,,	B. M'Nulty	0	10	0
						,, 16	R. Haddon Common	1	1	0
							Balance	117	1	1
		£138	10	4				£138	10	4

W. B. BURROWES.

EXCHANGES.

ABO—Publications of the Abo Academy.
ALBANY—Bulletins of the New York State Museum.
ANN ARBOR—Publications of the University of Michigan.
ATHENS—Publications of the Zoological Institute and Museum.
AUCKLAND—Reports of the Auckland Institute and Museum.

BASEL—Verhandlungen der Naturforchenden Gesellschaft in Basel.
BERKELEY, CAL.—Publications of the University of California.
BIRMINGHAM—Publications of the Birmingham Natural History and Philosophical Society.
BLOEMFONTEIN—Publications of the National Museum of South Africa.
BOSTON—Publications of the Boston Society of Natural History.
BOULDER—Publications of the University of Colorado.
BRUSSELS—Annals Societe Royale Zoologique de Belgique.
,, Bulletin Societe Royale de Botanique de Belgique.
BUFFALO—Bulletins of the Buffalo Society of Natural Sciences.

CALCUTTA—Publications of the Geological Survey of India.
CAMBRIDGE, MASS.—Publications of the Museum of Comparative Zoology.
CARDIFF—Transactions of the Cardiff Naturalists' Society.
CHICAGO—Publications of the Chicago Academy of Sciences.
CINCINNATI—Bulletin of the Lloyd Library.
COIMBRA—Publications of the Zoological Museum of the University of Coimbra.
COLORADO SPRINGS—Publications of the Colorado College.
COLUMBUS—Ohio Journal of Science.
COVENTRY—Proceedings of the Coventry Natural History and Scientific Society.
DANZIG—Schriften Naturforschenden Gesellschaft.
DUBLIN—Proceedings of the Royal Dublin Society.

EASTBOURNE—Transactions and Journal of the Eastbourne Natural History, Photographic and Literary Society.
EDINBURGH—Proceedings of the Royal Physical Society.
,, Proceedings of the Royal Society of Edinburgh.
,, Transactions and Proceedings of the Botanical Society of Edinburgh.
,, Proceedings of the Society of Antiquaries of Scotland.

GORLITZ—Publications of the Natural History Society of Gorlitz.
GOTEBORGS—Handlungar Regia Societas Scientiarum et Literarum Gotoburgensis.

HALIFAX, N.S.—Proceedings of the Nova Scotian Institute of Science.

INDIANAPOLIS—Proceedings of the Indiana Academy of Science.

LA PLATA—" Manuferos Fossiles de la Republica Argentina."
LAUSANNE—Memoirs and Bulletins de la Societe Vaudoise des Sciences Naturelles.
LAWRENCE—Bulletins of the University of Kansas.
LIMA—Memorias Sociedad de Ingenieros del Peru.

London—Quarterly Journal of the Royal Microscopical Society.
,, Publications of the British Association.
,, Proceedings of the Royal Institute of Great Britain.
,, Quarterly Journal of the Geological Society.
,, Publications of the Viking Society for Northern Research.
,, Reports of the National Trust.
Los Angeles—Publications of the University of California in Los Angeles.

Madras—Report of the Madras Fisheries Department.
Melbourne—Proceedings of the Royal Society of Victoria.
Montevidea—Archivos Sociedad de Biologia de Montevidea.
Moscow—Bulletin de la Societe des Naturalistes de Moscow.

New Haven—Transactions of the Connecticut Academy of Arts and Sciences.
New York—Annals of the New York Academy of Sciences.

Oslo—Publications of the University Library, Oslo.
Ottawa—Publications of the Geological Survey of Canada, Department of Mines.
,, Publications of the Canadian Dept. of Agriculture.
Padova—Atti dell Accademia Scientifica.
Philadelphia—Proceedings of the Academy of Natural Sciences of Philadelphia.
,, Proceedings of the American Philosophical Society.
Polska—Annales Panstevowe Museum Zoologienze.

Rennes—Bulletin Geologique et Mineralogique de Bretagne.
Riga—Publications of the Latvijas Universitates, Riga.
Rio de Janeiro—Archivos Botanico do Rio de Janeiro.
,, Publications of the National Museums of Brazil.
,, Publications of the Oswaldo Cruz Institute.
Rochester, N.Y.—Proceedings of the Rochester Academy of Science.

San Diego—Transactions of the San Diego Society of Natural History.
San Francisco—Proceedings of the California Academy of Sciences.
Stirling—Transactions of the Stirling Natural History and Archaeological Society.
St. Leonards-on-Sea—Report of the Hastings and St. Leonards Natural History Society.
,, Hastings and East Essex Naturalist.
St. Louis—Annual Report of the St. Louis Public Library.
Stratford—The Essex Naturalist.

Toronto—Transactions of the Royal Canadian Institute.
Torquay—Transactions and Proceedings of the Torquay Natural History Society

Vienna—Verhandlungen Zoologisch-Botanischen Gesellschaft.

Washington—Annual Report of the Smithsonian Institution.
,, Proceedings of the United States National Museum.
,, Smithsonian Institution, Miscellaneous Collections.
,, Publications of the United States Geological Survey.
,, Publications of the United States Department of Agriculture.
Welshpool—Publications of the Powys-land Club.

York—Annual Report of the Yorkshire Philosophical Society, 1936.

Zurich—Publications of the Natural History Society of Zurich.

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